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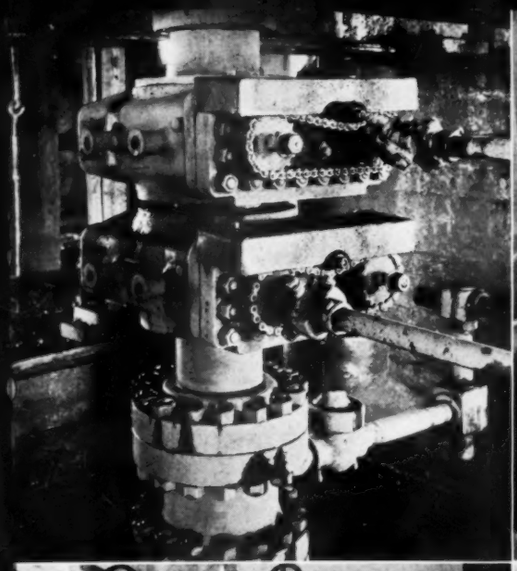

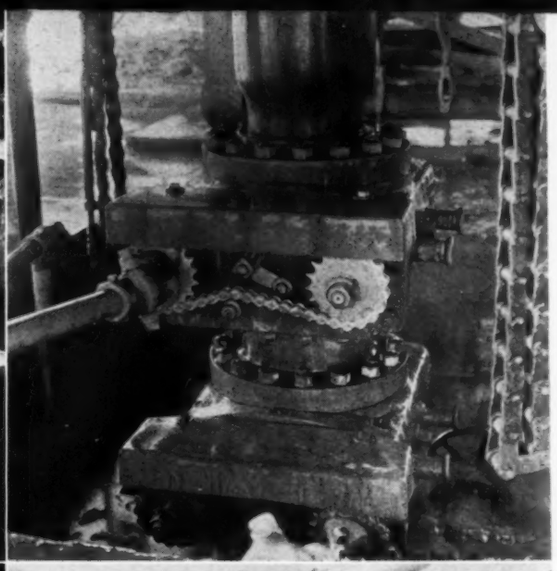

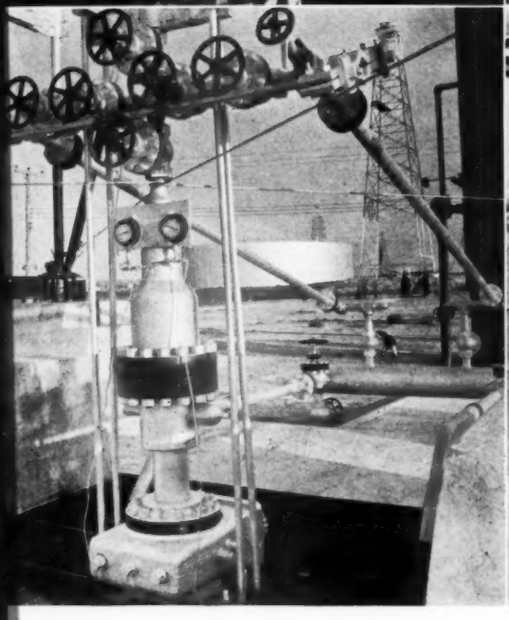

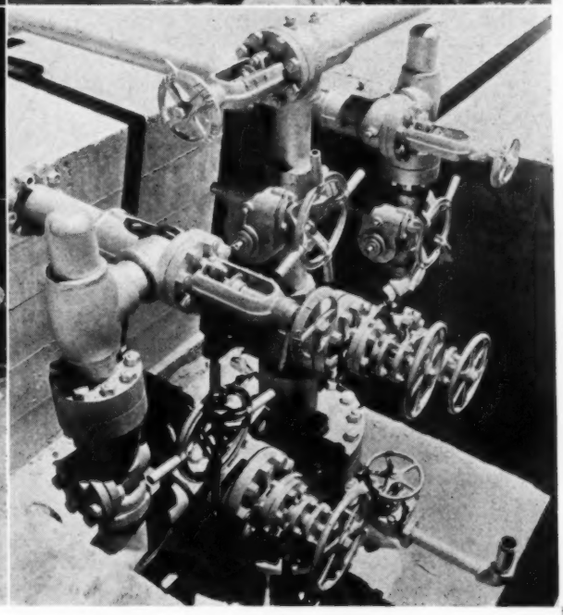

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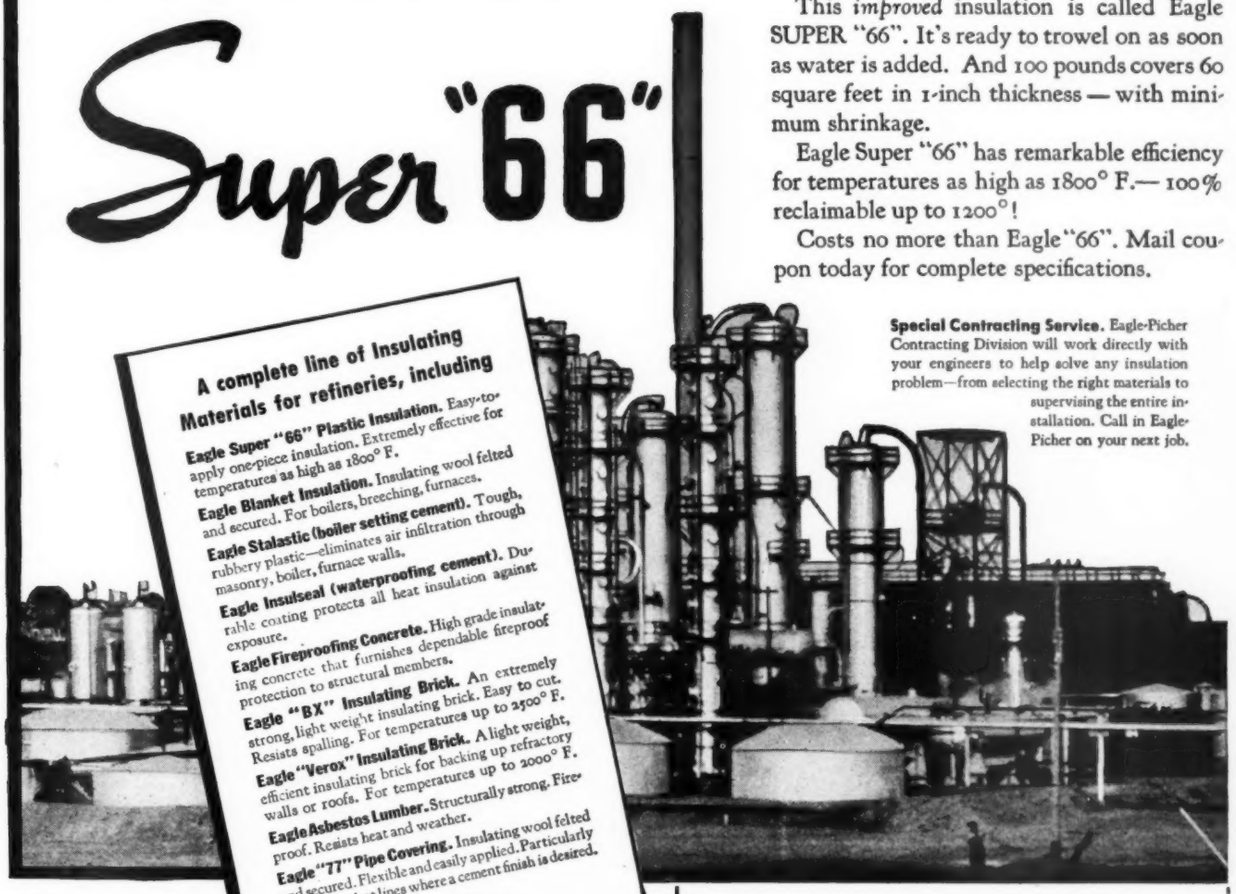

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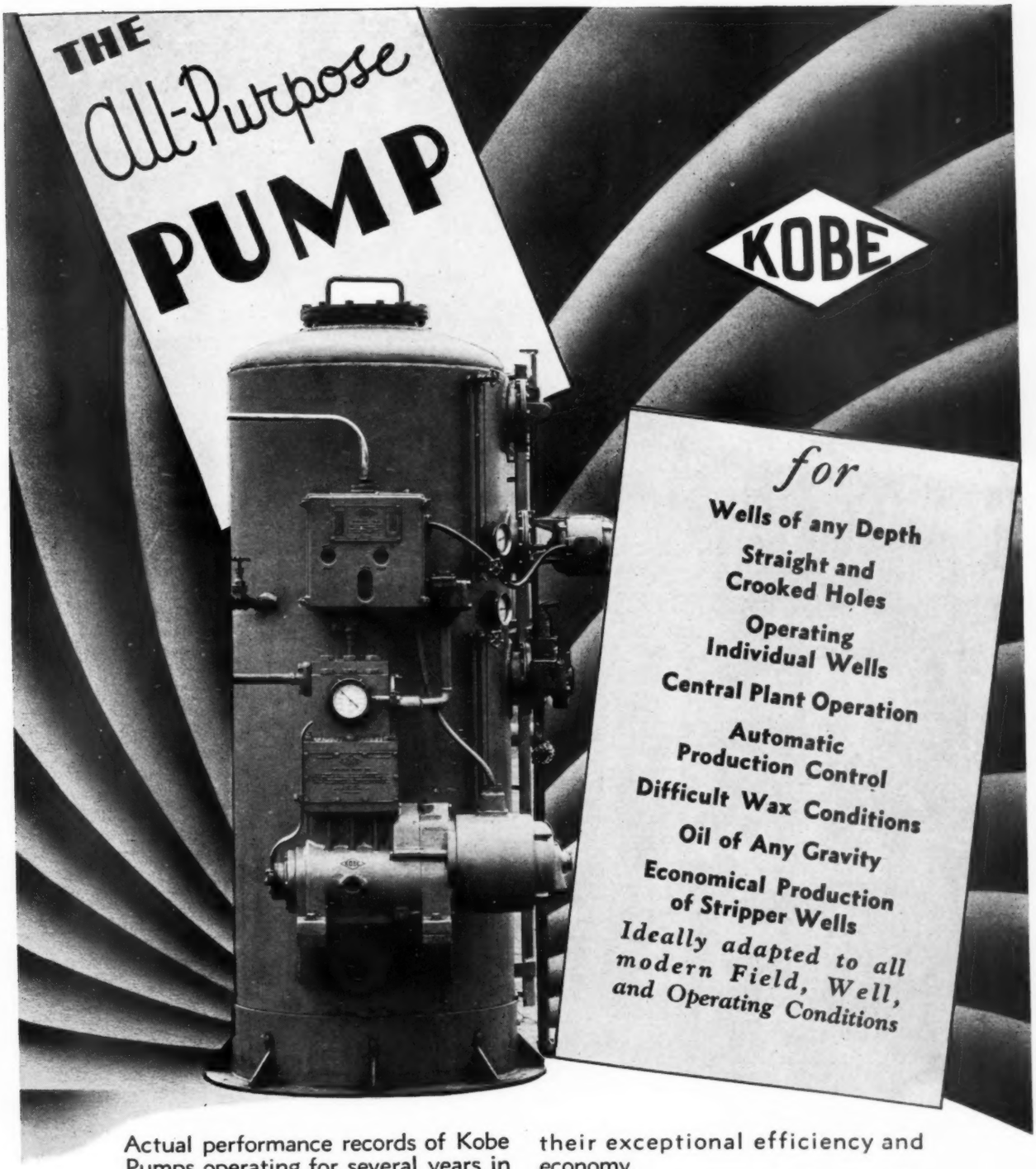

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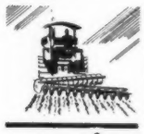
Like a dancer clothed in a fan, some *figures* are hard to see because they are often clothed or veiled by confusion.

May we unveil certain facts and figures relating to the Sievers Reamer by comparison with merchandise, other than oil field equipment, which has been accepted as being highly successful the world over and generally adapted as safe, economical, fool-proof industrial equipment.



Agricultural Comparison . .

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THE Petroleum Engineer

MAY 1936

VOLUME VII NUMBER VIII

A MAGAZINE OF METHODS FOR OPERATING MEN

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Independent Petroleum Association of America, Mid-Year Meeting—May 21, Tulsa, Oklahoma.

National Stripper Well Association, Annual Meeting—May 22, Tulsa Oklahoma.

Oil Field, Gas Well, and Refinery Workers Union, International Convention—June 1, 2, 3, and 4, Hotel Tulsa, Tulsa, Oklahoma.

California Natural Gasoline Association—June 4, Richfield Building, Los Angeles.

American Petroleum Institute, Division of Production, Eastern District—June 4 and 5, William Penn Hotel, Pittsburgh, Pennsylvania.

American Society of Mechanical Engineers, Semi-Annual Meeting—June 15, 16, 17, 18, 19, and 20, Dallas, Texas.

Pennsylvania Grade Crude Oil Association, Annual Meeting—June 18 and 19, State College, Pennsylvania.

American Society for Testing Materials, Annual Meeting—June 29 to July 3, Chalfonte-Haddon Hall, Atlantic City, New Jersey.

Interstate Oil Compact Commission—July 31, Dallas, Texas.

American Chemical Society, Semi-Annual Meeting—September 7, 8, 9, 10, 11, and 12, Pittsburgh, Pennsylvania.

American Petroleum Institute, 17th Annual Meeting—November 9, 10, 11, and 12, Chicago, Illinois.

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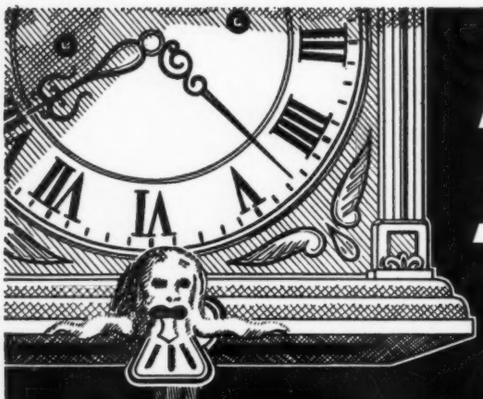

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The Course of Oil

By K. C. SCLATER

International Petroleum Exposition Equipment valued at more than ten million dollars is now on display at the International Petroleum Exposition at Tulsa, Oklahoma.

Whether you be a roustabout or a high-ranking executive, attendance at this display provides a quick means of obtaining a valuable education covering the very latest advances in methods and equipment employed throughout all branches of the petroleum industry. Those who are fortunate enough to visit this Exposition should consider it a rare privilege and opportunity.

Problem of Conserving Natural Gas During the meeting of the American Gas Association at Dallas this month the need for greater conservation of natural gas was stressed by one of the speakers. This brings up a point that may well be pondered by all oil men, and that is:

Despite the fact that evidence can be seen on all sides of a rapidly growing consciousness of the value of natural gas, too much apathy still is prevalent among oil producers concerning the full utilization of natural gas in the production of oil.

In the Oklahoma City field today, operators are confronted with the problem of how to produce their wells economically by pumping or other artificial means. And why? Chiefly because of the depletion of gas energy, a condition that might have been avoided or at least mitigated had firmer precautions been taken in the early development of the field. Although this is only one of many fields that have suffered such a setback, the great depth of the wells in this field has served to emphasize the plight in which producers have been placed by the dissipation of gas and gas energy.

Only now is the Railroad Commission becoming aroused over the dissipation of gas accompanying the production of oil in Texas; but the surprising fact is that the oil producers themselves do not seem to be greatly perturbed over it despite the fact that the gas is a valuable source of energy and can be utilized in various ways not only for producing oil but also for increasing the ultimate recovery.

The problem of the proper utilization of gas in the recovery of oil is really a question of how to do so economically. Sometimes the expense of installing the necessary equipment for returning gas to the pay sand is hard to justify in the flush stage of production; but more often the probable ultimate reduction in lifting costs and increase in ultimate recovery would justify the expenditure.

To put any such plan in effect in the average field would require the consent and coöperation of all operators; and this frequently is a stumbling block. Be that as it may, dissipation of gas accompanying the production of oil is an offense that should not be condoned. It is to every oil producer's interest to conserve this valuable source of energy.

Rational Segregation of Costs According to the annual report of one of the major oil companies of California, its proposed expenditures for intangible drilling costs are segregated into two classes, those applying on wells drilled in prospect areas and those applying on wells drilled in so-called proven areas. Intangible drilling costs in prospect areas are currently charged directly to expense and are not restored to capital even though a producing well may be obtained. Those in proven areas if resulting in a producing well are added to capital, or resulting in a dry hole are charged directly to expense. Treating intangible development costs in this manner results in substantial direct charges to expense in each year over and above the depletion and depreciation charge.

Overall unit charges per barrel are set aside as depletion and depreciation of oil producing properties and improvements including the portion of the development cost that is capitalized. Various factors enter into the determination of this unit rate such as the estimated recoverable reserves, the past and probable future cost of development, and the cost experience from time to time in acquiring crude oil reserves. Resurveys of the adequacy of this figure are made as changes in factors warrant. A survey of the last ten years shows that the company and its wholly owned crude oil producing subsidiaries have, on the average, charged against earnings 33.02 cents per barrel on the company's working interest production for depletion, depreciation, and direct expense charges for development and undepreciated abandonments. Of this amount 22.46 cents is depletion and depreciation, and 10.56 cents represents direct charges to expense. These figures vary from year to year according to where the production is and the extent of prospect development and abandonments.

Prospecting In England Another drilling campaign in the search for oil in England has just begun and is somewhat in contrast to the first drilling campaign of some fifteen years ago with cable tools, when oil in small commercial quantity was discovered. The rotary method of drilling is being used and the entire equipment is of the heaviest and most up-to-date type available. A thorough geological study of the region by modern scientific methods preceded the selection of the site on which the well is being drilled. If oil in commercial quantity is discovered development will be along the most modern lines. This venture, which is generally regarded in the nature of a national experiment, is being undertaken by the prospecting subsidiary of the Anglo-Iranian Oil Company. Just how interesting a chapter it will make in the history of oilfield development is beyond prediction at this time.

« « « HIGHLIGHTS IN OILDOM » » »

Would Fix Uniform Rules For Rodessa

Negotiations are being carried on between the Texas Railroad Commission and the Louisiana Conservation Commission for the purpose of bringing about a joint session of the two bodies in order that uniform rules and regulations governing Rodessa may be fixed. Inasmuch as the field is in both Louisiana and Texas, and drilling characteristics are similar in both states, it is felt by many that uniform regulations on well spacing, etc., based upon scientific facts should be adopted jointly by the two governing bodies.

When members of the two commissions met in Marshall, Texas, several weeks ago the Louisiana body took the position that the field had not been sufficiently developed to warrant uniform regulations. The Texas commission, feeling that developments since that time should justify a reconsideration of the matter, is taking the initiative in bringing about another meeting, according to Chairman Ernest O. Thompson. The two commissions are now enforcing an allowable of 350 bbl. per well per day.

●

To Drill Test in Sussex, England

Approval has been given the Anglo-Iranian Oil Company by the Chanctonbury Rural District Council for the drilling of a test at Henfield, Sussex, England. The site is three miles north of Steyning on the Steyning-Horsham road, and drilling is expected to commence within 30 days.

●

Work on Unit Plan for New Santa Maria Field

Operators are working on details of a unitization plan for the new Santa Maria, California, field, discovered recently by the Union Oil Company. After bringing in a well with an estimated production of 2000 bbl. daily, it was shut in until storage facilities could be provided. No offsets will be drilled until an agreement is reached on some workable unitization plan.

●

Oklahoma City Loses Fight to Restrict Drilling

With the municipality of Oklahoma City thus far defeated in court in every effort to limit the drilling zone within the city, it seems to be the consensus that the election of May 12, leaving the matter up to the voters, definitely will end the controversy, with the city officials in utter rout. On that date it will be decided whether the exclusive Lincoln Terrace, Howe's State Capitol, Howe's Second Capitol, and Classen's North Highland Park additions will be opened to drilling.

In the battle to date the State Supreme Court has handed down three rulings adverse to the wishes of city officials. The first was when the court denied the city's application for a temporary injunction to prevent drilling on state property near the state capitol. The second came when the court refused to stop the K. and L. Oil Company from drilling its well on the Harn tract south of the capitol; and the final blow was the refusal of the court to stay a district court injunction that forbid the city to interfere with two wells being drilled by the Fairfax Petroleum Company north of the capitol.

Extraction Patents Granted Pennsylvania Oil Association

Research work conducted at State College under the auspices of the Pennsylvania Grade Crude Oil Association has resulted in the granting of three patents to the Pennsylvania Petroleum Research Corporation, patent holding body for the association. Two of the patents concern processes for the solvent extraction of mineral oils, the third relates to vacuum control.

The solvent extraction patents cover a means of intimately mixing the oil and the solvent, one of the liquids passing through the other although maintained for the most part in a plurality of separate, small streams. The process serves to obtain a highly intimate contact between the oil and the solvent, thus increasing the efficiency of the solvent; and to avoid channeling of one liquid though the other.

The vacuum control covered in the third patent serves to maintain an extremely low and constant pressure in the testing of oil samples by the Engler Index method.

●

Water-flooding Increases Production At Nowata

The success of the water-flooding project instituted in the Nowata, Oklahoma, area about six months ago by the Forest Production Company, has resulted in something of a boom in that stripper area. As told previously in *The Petroleum Engineer*, water was injected into the Bartlesville sand on the old Warner-Caldwell leases near Big Creek. Prior to the initiation of the project some of the wells were down to as low as one-half barrel per day, and some really remarkable increases in production have been reported. A new pipe line has been run into the district to care for the excess production, and numerous drilling rigs are in operation on the various properties.

●

Humble vs. Brown Case Again Will Go to High Court

The case of Humble vs. Brown, relating to well spacing, for many months has demanded the attention of Texas courts and, as the result of a recent decision by District Judge Ralph Yarborough, again is on its way to the Texas Supreme Court. Judge Yarborough recently rendered a judgment upholding the Texas Railroad Commission's order permitting a second well to be drilled on a three-acre tract involved in the famous case, basing his decision on a jury finding that the second well was necessary to prevent waste.

The original suit involved the question of whether the Railroad Commission had the right to issue a permit to drill on a one and one-half acre tract to protect vested rights. The case went to the Texas Supreme Court and that body held that subdivision of the tract was in violation of Rule 37 and that the well could not be drilled.

The most recent case involved the point of whether the two one and one-half tracts combined into one unit were entitled to two wells on the ground of physical waste. The jury, and later Judge Yarborough, held the two wells were justified. It is understood attorneys for the Humble will appeal the case to the Supreme Court.

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LATEST ACTIVITIES IN THE OIL FIELDS

A NEW Gulf Coast discovery in Texas is that of the Salt Dome Oil Corporation and the Gem Oil Company with its No. 2 Lawrence on the Cotton Lake prospect of northern Chambers County. The well came in flowing an estimated 25 bbl. of oil and washwater per hour through ¼-in. choke. Production is from the Marginulina sands at a depth of 6642-6661 feet.

Considerable drilling is expected in the area due to the fact that the acreage is not controlled by one or two companies.

●

Considered of great importance is the completion in the Oolitic lime, immediately on top of the Permain, by the Phillips Petroleum Company in Ouachita County, Arkansas, northeast of Smackover. The well, No. 1 J. D. Reynolds, was drilled to a total depth of 4909 ft., making initially an estimated 10,000,000 cu. ft. of wet gas per day, as well as considerable distillate.

The company decided to kill the gas flow and explore the oil producing possibilities of the Permian lime, estimated to be 800 ft. in thickness. If no large quantities of oil and gas are found at the greater depth, the well will be completed at the original level.

●

Oil has been discovered underlying the Baker-Glendive gas field of Fallon County, Montana, indicating the possibility of a large black oil reserve for the state. The discovery well is the No. 1 Unit of the Dakota-Montana Utilities Company and was drilled to a total depth of 6793 ft., the second deepest well in Montana. On the initial test 30 bbl. of black oil was produced per hour.

●

New pools continue to be added to the constantly growing total in Western Kansas. Within recent weeks four new discoveries have been made. Farris, Grattan, Armer and Wakefield brought in a well (No. 1 Snyder) in Stafford County, five and one-half miles southwest of the Raymond pool, making approximately 118 bbl. per hour. In Rice County, three-quarters of a mile west of the Rickard pool, Empire Oil and Refining Company had a good showing of oil at 3308 feet. Atlantic Oil Producing Company et al's No. 1 Hiss in southwestern Barton County appears to be a 400 to 500 bbl. producer at 3285 ft. in the Lansing lime. No. 1 Roth of the Derby Oil Company in southeastern Barton County had an excellent showing on a core test at 3331 feet.

●

A deep test, considered of importance, has been completed in West Virginia, resulting in a 3,345,000 cu. ft. per day gas well. The well, in the Poca district, Kanawha County, was drilled by W. O. Zeibold et al. Production is from the Oriskany sand at a total depth of 4869 feet.

●

The Shell Oil Company's No. 1 K. C. L., a wildcat test eight miles east of the Elk Hills field in California, has cored oil sand from 7830 ft. to 7888 ft., and is looked upon as being possibly the most significant development in the area since the Kettleman Hills discovery. The test is said to be unusual in its oil sand recovery for that part of the San Joaquin Valley.

●

In Park County, southwestern Colorado, a new oil pool has been opened by the South Park Oil Company. Drilling its No. 1 State to a total depth of 4157 ft., the company was successful in bringing in a well making 50 bbl. of oil per hour from the Apache Creek member of the Pierre shale.

●

Completion of a third producer in the Talco area of northeast Texas seems assured with the showing made by Humble Oil and Refining Company's No. 1 Myra Galt. After drilling to a total depth of 4347 ft. a drill stem test was made, revealing 1800 ft. of mud and oil. The top of the Paluxy pay was reached at 4186 feet.

AVERAGE CRUDE PRICES

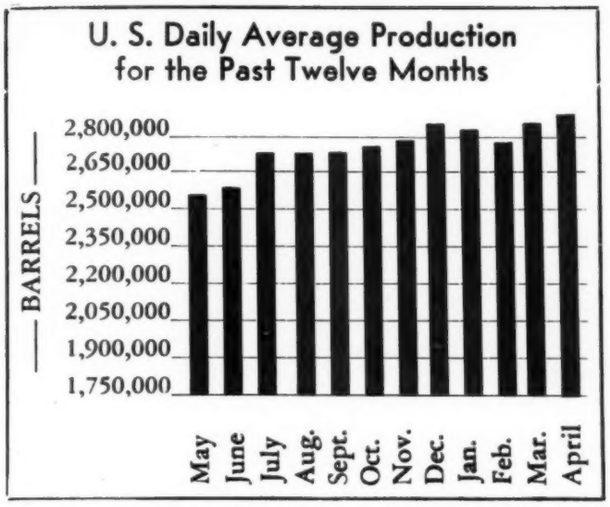
California	
Kettleman Hills	$1.22-$1.43
Playa Del Rey	1.10
Coalinga	.70-.90
Signal Hill	1.10
Montana	1.45
Wyoming	1.10
Colorado	1.00-1.10
New Mexico	.75-.95
Texas	
North Central	.84-1.08
Panhandle	.81-.98
West Texas	.75-.95
Gulf Coast	.85-1.30
Darst Creek	.88-1.22
East Texas	1.15
Kansas	1.10
Oklahoma	1.10
Arkansas	.75-.80
Louisiana	
North Louisiana	$ .86-$1.10
Gulf Coast	.82-1.22
Illinois	1.23
Kentucky	1.23
Indiana	1.12
Ohio	
Lima	1.25
Michigan	1.12
Pennsylvania	
Bradford	2.45
Southwest	2.17
Eureka	2.12
Buckeye	1.97
Corning	1.42
West Virginia	1.67
Canada	2.10-2.17

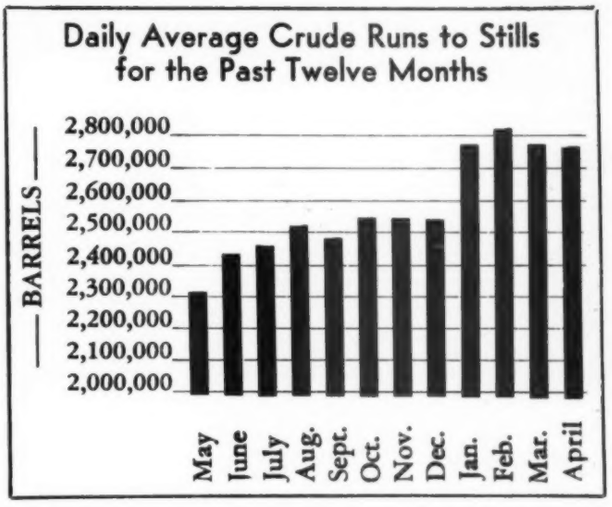
DAILY AVERAGE CRUDE OIL PRODUCTION

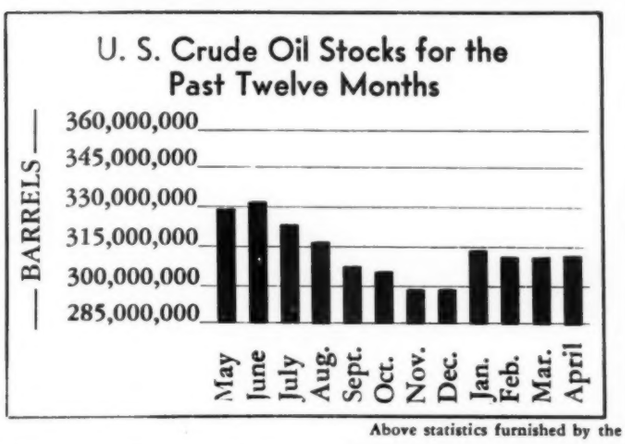
Supplied by A.P.I.

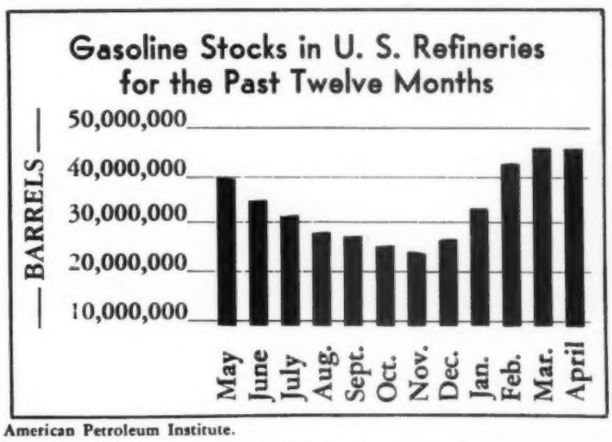
Figures in Barrels

	B. of M. Dept. of Interior Calculations (April)	Week Ended April 25, 1936	Week Ended March 28, 1936	Week Ended April 27, 1935
Oklahoma	525,000	557,100	546,050	522,750
Kansas	146,000	159,100	159,600	146,000
Panhandle Texas		64,000	63,100	61,650
North Texas		59,450	57,600	58,450
West Central Texas		25,000	25,050	23,300
West Texas		180,800	176,050	152,950
East Central Texas		50,850	49,900	48,800
East Texas		447,400	442,600	443,600
Southwest Texas		79,450	74,000	62,400
Coastal Texas		248,850	230,600	181,400
TOTAL TEXAS	1,122,800	1,155,800	1,118,900	1,032,550
North Louisiana		68,300	65,450	22,900
Coastal Louisiana		145,700	137,650	101,450
TOTAL LOUISIANA	160,900	214,000	203,100	124,350
Arkansas	30,500	29,850	29,700	30,200
Eastern	104,100	102,400	103,250	108,450
Michigan	41,000	32,300	37,750	40,900
Wyoming	34,800	34,900	35,650	33,100
Montana	12,300	10,350	13,300	10,450
Colorado	4,100	5,100	4,350	5,000
New Mexico	63,200	63,400	60,850	50,350
TOTAL EAST OF CALIF.	2,244,700	2,364,300	2,312,500	2,104,100
California	552,600	568,400	563,700	457,300
TOTAL U. S.	2,797,300	2,932,700	2,876,200	2,561,400









Above statistics furnished by the American Petroleum Institute.

Summarized Operations in Active Fields for April, 1936

Fields	Completions	Producers	Rigs	Drilling Wells	Depth of Production	No. Casing Strings	Gravity of Oil	Type of Tool Used
TEXAS								
East Texas	244	232	52	135	3600	2	40	Rotary
Duval County	103	93	21	43	2300	2	22	Rotary
Archer County	46	27	16	38	660–1800	1 or 2	40	Rot.-Cab.
Conroe	2	2	2	2	2000–7400	3 or 4	40	Rotary
Panhandle	50	49	35	154	2200–3900	2	40	Rotary
Refugio County	5	5	2	5	5200	2	38	Rotary
OKLAHOMA								
Oklahoma City	12	12	49	209	6500	3	39	Rotary
Pontotoc County	28	26	16	87	1800–4488	2 or 3	38	Rotary
Osage County	22	16	15	46	380–2850	2	37.5–40	Rot.-Cab.
KANSAS								
McPherson County	4	3	2	7	2900–4300	2	38	Rot.-Cab.
Harvey County	1	0	2	2	3450	2 or 4	37	Rot.-Cab.
Ellsworth Arch	80	69	38	131	3300	4	37	Rot.-Cab.
LOUISIANA								
Rodessa	23	23	11	65	5985–6450	3	39	Rotary
CALIFORNIA								
Kettleman Hills	4	2	6	31	8300	3 or 4	40	Rotary
Long Beach	3	3	2	8	7000	3	36	Rotary

Field Activities by States for April, 1936

State	Completions		Producers		Locations		Rigs		Drilling Wells		Production, 1935 (In Barrels)
	April	March	April	March	April	March	April	March	April	March	
Arkansas	4	8	2	2	10	6	10	9	39	33	11,140,750
California	59	59	47	52	107	62	86	85	234	209	207,899,480
Colorado	3	3	1	1	....	....	4	3	26	23	1,565,150
Illinois	....	2	....	1	....	....	23	22	7	6	4,352,000
Indiana	27	29	13	14	....	....	5	3	67	64	762,000
Kansas	125	122	98	96	190	131	61	51	326	274	53,013,450
Kentucky	22	13	11	10	....	....	7	4	17	14	4,860,000
Louisiana	83	85	63	67	128	113	68	59	232	196	50,299,950
Michigan	49	49	33	35	50	48	80	79	121	118	15,661,350
Mississippi	....	....	....	....	....	....	1	1	10	9	Gas. Prod.
Montana	11	3	10	2	....	....	11	9	64	57	4,304,100
New Mexico	40	39	40	38	....	....	17	14	118	111	19,195,500
New York	....	....	....	....	....	....	1	1	2	2	3,191,990
Ohio	156	117	108	81	....	....	43	39	178	169	4,234,000
Oklahoma	220	194	153	139	384	228	86	69	696	556	181,152,050
Pennsylvania	....	....	....	....	....	....	14	12	109	106	14,478,000
Texas	1025	935	810	719	1338	1170	587	512	1667	1442	377,747,205
West Virginia	86	24	77	22	....	....	35	32	126	116	3,818,400
Wyoming	4	4	4	3	....	....	11	7	73	64	13,320 100
Totals	1914	1686	1470	1282	2207	1718	1150	1011	4112	3569	970,995,385

PROGRESS OF MAJOR PIPE LINE WORK

WORK has started on the laying of an 81-mile pipe line in Kansas for the Continental Oil Company. An 8-in. line will extend from Geneseo to Valley Center, with a 4-in. lateral to the Mound Ridge pool in McPherson County, which will tie into the main line near Burrton. The line will have a capacity of 14,000 bbl. daily. Pumping stations will be erected at Geneseo and Mound Ridge, and a telephone and telegraph system will be provided. Completion of the project is planned for about July 1st. All new pipe is being used. The crude will be pumped to the Continental's refinery at Ponca City, Oklahoma.

Williams Brothers Construction Company, Tulsa, Oklahoma, has been awarded the general contract, with a subcontract for multi-flame Lindewelding let to the Osage Construction Company.

Construction of this pipe line is a part of a $12,000,000 development program that will be carried on in Kansas by the Continental Oil Company during the next 18 months. Approximately $650,000 will be expended on the pipe line project, the rest to be for the drilling of approximately 300 wells in the Geneseo and Mound Ridge areas.

●

To supplement its existing transportation facilities the Shell Oil Company has announced from its headquarters at San Francisco, California, plans for the construction of a 304-mile oil pipe line from the San Joaquin Valley oil fields to the company's refinery at Martinez.

In making the announcement President S. Belither stated that approximately $4,500,000 would be expended in the construction of the line, and that 25,000 tons of steel pipe will be required. It will have a capacity of 25,000 bbl. daily.

●

Difficulty experienced by a number of independent Michigan refineries in obtaining sufficient crude oil has resulted in the formation of plans calling for the construction of a 360-mile pipe line and a system of oil barges for the transportation of crude into the state from fields in Louisiana and East Texas. John Borden, president of the Old Dutch Refining Company, Muskegon, Michigan, has made the announcement. Detroit and Pittsburgh interests proposed the project. They are being represented in Michigan by Mark Hanna of Detroit and Walter Russell of Pittsburgh and, following negotiations, it is understood they are prepared to guarantee the Michigan independents a minimum of 10,000 bbl. of crude daily for a period of ten years.

The proposed pipe line and barge system contemplates the transportation of crude up the Mississippi and Ohio rivers to a point approximately ten miles south of Cincinnati, thence by pipe line to Michigan refinery centers. It would require about six months to complete.

●

The 106-mile 20-in. combination welded and Dresser coupled gas line being laid for the Northern Natural Gas Company from the Hugoton gas field to Mullinville, Kansas, is expected to be completed by June 1st. The new line will connect the Northern Natural's Hugoton properties with its trunk line running from the Panhandle to Minneapolis. Heretofore the Northern Natural Gas Company's Hugoton production has been taken by the Panhandle Eastern Pipe Line Company, but new Detroit contracts will require the latter's entire load. The new line will connect with 86 wells.

●

The Grand Rapids Gas Light Company has been granted authority by the Michigan Public Utilities Commission to lay a 60-mile pipe line to serve consumers in that city. The gas will be a natural and artificial mixture. The natural gas supply will be from the Millbrook-Hinton-Belvidere Townships field in Mecosta and Montcalm counties, and it is expected that the pipe line will be completed about June 15th.

●

A contract has been awarded to Connor and Sons Construction Company, Kansas City, Missouri, for the laying of a 12-in. 24-mile multi-flame Lindewelded pipe line for the Kentucky Natural Gas Corporation. The line will run between Terre Haute and Montezuma, Indiana, connecting the Kentucky Natural Gas Corporation's present line from Owensboro, Kentucky, to Terre Haute, Indiana, with the Panhandle Eastern Pipe Line Company's trunk line.

●

The San Diego Consolidated Gas and Electric Company, starting May 15th, will lay a new 15-mile pipe line completely Lindewelded from Carlsbad to Escondido, California. It will be of 2½-in. and 3-in. standard pipe and will carry natural gas at a peak pressure of 400 pounds.

●

The Continental Oil Company is completing a 19-mile welded gasoline pipe line from Lance Creek to Manville, Wyoming. The capacity of the line will be 5000 gal. daily and will transport gasoline from the Continental's gasoline plant at Lance Creek to a railway tank car siding at Manville. The new line is of 2-in. pipe and parallels a 4-in. line recently put into operation by the same company.

Sterns Rogers Manufacturing Company of Denver, Colorado, has the construction contract.

●

Nueces County, Texas, soon will have two new pipe line outlets for crude produced in the several fields of that area. The Potter Pipe Line Company is laying a combination 6-in. and 8-in. line from the Clarkwood Townsite pool through the Saxet and Corpus Christi fields to tidewater at Corpus Christi, where the crude will be loaded into tankers. The only previous pipe line outlet from these fields belongs to The Texas Pipe Line Company.

The other new line is that of the Republic Pipe Line Company, a 4-in. carrier that will serve the main Saxet field and the Saxet Heights field. It will terminate at Corpus Christi, where the Republic will erect a tank farm. The new line also will connect the Republic's line to the Plymouth field with the tank farm.

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THE MONTH'S ACTIVITIES IN REFINING

Percent Refinery Capacity Operated

Western Division, 70.4 percent **Central Division, 75.9 percent** **Eastern Division, 80.4 percent**

THE Quaker State Oil Refining Corporation is commencing a program of alterations, additions, and repairs at its McKean plant, Farmers Valley, Pennsylvania, embracing the construction of a new dewaxing plant, new boiler house and boiler equipment, and electrical generating equipment.

The new wax plant, which is to be constructed by the E. B. Badger Sons' Company, New York City, employs the most modern method for dewaxing lubricating oils, using methyl ethyl keystone and benzol as a solvent for the precipitation of the wax.

The boiler house addition will consist of a 1400 hp. boiler of the high pressure type, designed for utilization of gas, fuel oil, or powdered coal. The power house installation will include a new feed water treating plant.

It will require five to six months to complete.

●

Socony-Vacuum Oil Company, Inc., is making additions to its refinery at Olean, New York. The program calls for a solvent extraction and dewaxing plant, new electrical power equipment, and additions to the distillation units.

●

The Shell Petroleum Corporation has announced that it will erect a 20,000-bbl. per day combination topping, cracking and reforming unit, and a vacuum rerun unit at its refinery south of Houston, Texas. With this unit completed the plant will be capable of handling 76,000 bbl. of crude daily.

●

The Kendall Refining Company is initiating a construction program at its Oil City, Pennsylvania, refinery that will include the addition of a solvent dewaxing and deresinating plant, new boiler house, and a new electricity generating plant. M. W. Kellogg Company has the contract for construction of the solvent plant.

●

The Ralph M. Parsons Company of Chicago has been given a contract to design and erect for Leonard Refineries, Inc., of Detroit, a Dubbs two-coil, selective cracking unit and a Dubbs reforming unit, each to have a rated charging capacity of 1000 bbl. a day. Work already is starting.

The new units are to be built at Alma, Michigan, on a site adjoining the 3000-bbl. Acme skimming plant, that is now owned by the Leonard company. The skimming operations are to be tied in with those of the cracking and reforming units.

●

The Barnsdall Refining Corporation has instituted a program of improvement at its Wichita, Kansas, refinery. The four Dubbs cracking units in the skimming plant with a total capacity of 1500 bbl. daily will be replaced by new Dubbs equipment.

●

The Warren Petroleum Corporation and the Natural Gasoline Corporation have started construction of a natural gasoline absorption-type plant at Galva, Kansas, a short distance northeast of McPherson. The plant is expected to be completed by June 1st and will handle 15,000,000 cu. ft. of gas daily, producing approximately 25,000 gal. of gasoline. As a part of the equipment a new-type compressor will be installed, having a vertical power unit and a horizontal compressor.

●

New equipment is being installed in the Myrtis, Louisiana, natural gasoline plant of the United Gas Public Service Company that will enlarge its capacity greatly. At present the plant, which is of the absorption type, is handling 85,000,000 cu. ft. of gas daily, received from the Rodessa field, and when the new installations have been made will have a capacity of approximately 150,000,000 cu. ft. daily.

●

An absorption-type gasoline plant is being constructed in the Rodessa, Louisiana, field by the Glenrose Gasoline Company, headed by Patrick Marr. The plant will have a daily capacity of 15,000,000 cu. ft. of gas. Completion of the plant is planned for July 1st.

Crude Runs to Stills, Gasoline and Gas and Fuel Oil Stocks
Week Ended April 25, 1936
A.P.I. Figures
(Figures in Barrels of 42 Gallons Each)

DISTRICT	Percent Potential Capacity Reporting	Daily Avg. Crude Runs to Stills	Percent Operated of Total Capacity Reporting	Total Motor Fuel Stocks Thousands of Bbl.	Gas and Fuel Oil Stocks Thousands of Bbl.
East Coast	100.0	489,000	79.9	19,992	6,433
Appalachian	94.8	109,000	74.7	2,811	378
Ind., Ill., Ky.	95.9	367,000	86.6	11,375	2,848
Okla., Kans., Mo.	84.8	279,000	72.7	7,512	2,441
Inland Texas	48.5	96,000	60.0	1,657	1,576
Texas Gulf	96.8	619,000	94.1	8,016	6,676
La. Gulf	96.4	127,000	77.9	2,042	2,076
No. La.-Ark.	90.0	54,000	75.0	405	338
Rocky Mt.	61.9	47,000	78.3	1,684	753
California	92.6	494,000	62.6	12,917	71,376
Reported	89.6	2,681,000	77.3	68,411	94,895
Est'd. Unreported	.....	194,000	.....	4,126	1,907
*EST'D TOTAL U. S. Apr. 25, '36	.....	2,875,000	.....	72,537	96,802
*EST'D TOTAL U. S. Apr. 18, '36	.....	2,795,000	.....	73,015	96,754
U. S. B. of M. April, 1935	.....	2,502,000	.....	**64,393	**97,727

*Bureau of Mines basis currently estimated.
**As of April 30, 1935.

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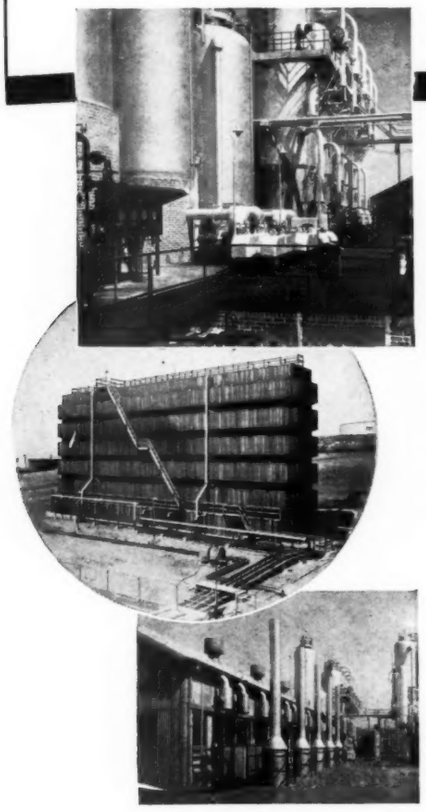

Illustrating Fluor construction. Top: propane dewaxing plant. Center: Aerator type cooling tower. Bottom: a battery of air-cooled mufflers.

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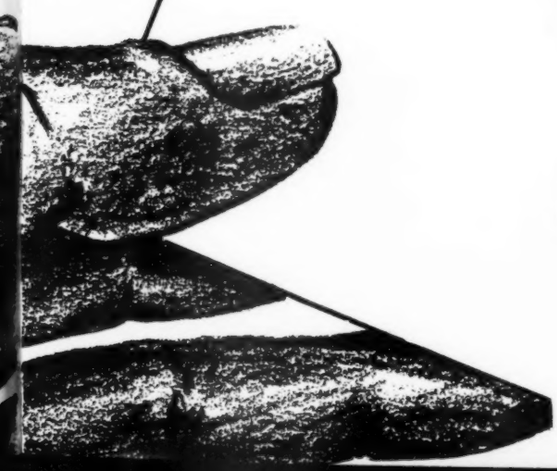

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10 ♥ The Globe B-3 Bit—since 1927—has been the leader for drilling straight hole in a wide variety of formations. The "stepped" teeth cut a short core which helps in drilling straight hole; and eliminate "diamond pointing." Six reaming edges maintain full-gauge hole. No weight or side thrust is placed upon bolts. Replaceable molybdenum steel heads may be repeatedly rebuilt.

J ♥ A Globe Re-Drill Bit with diamond-point pilot bit is used for reaming out rat hole made with a core barrel or a small bit. Or it may be equipped with a Globe M-5 Bit to provide a successful "tandem-type" drilling unit. Both the Re-Drill Cutter and the Bit are held in place by our patented lock, and are changed without using tongs or bit breaker and without removing shank from drill collar.

Q ♥ Strong, simple design and positive expansion combine to make the Globe Rotary Underreamer safe and profitable for enlarging the hole (a) to set pipe easily; (b) to secure water shut-off; (c) to set larger liner without turning down couplings; and other important uses. The cutters are expanded by a positive, mechanical wedging action and successfully ream and maintain full-gauge hole.

K ♥ The Globe Roller Bearing Rock Core Bit provides a "double-duty" outfit which takes cores from the hardest formations, or from soft and broken formations, by simply changing heads. Roller bearing cutters with deep-cut, sharp teeth take hard formation cores, which are readily pulled by a catcher which contains both slips and dogs. Cutters are easily changed, without welding. Soft Formation Heads are readily re-built and are provided with positive, cam-actuated dog-type core catchers. The "floating" threadless Inner Barrel stands still with the core, and high core recovery and low costs are assured.

A ♥ Here is a "fishing" bit which quickly and safely recovers from bottom all metal junk ranging in size from bolts, parts of bits and steel splinters up to slips and pipe couplings. Narrow tapered teeth guide the "fish" to center where they pass upward through a double, dog-type core catcher. Small junk is carried into the barrel on top of a short, large diameter core; larger "fish" are usually gripped by the dogs in the core catcher—and in either case positive, fast recovery is a simple operation.

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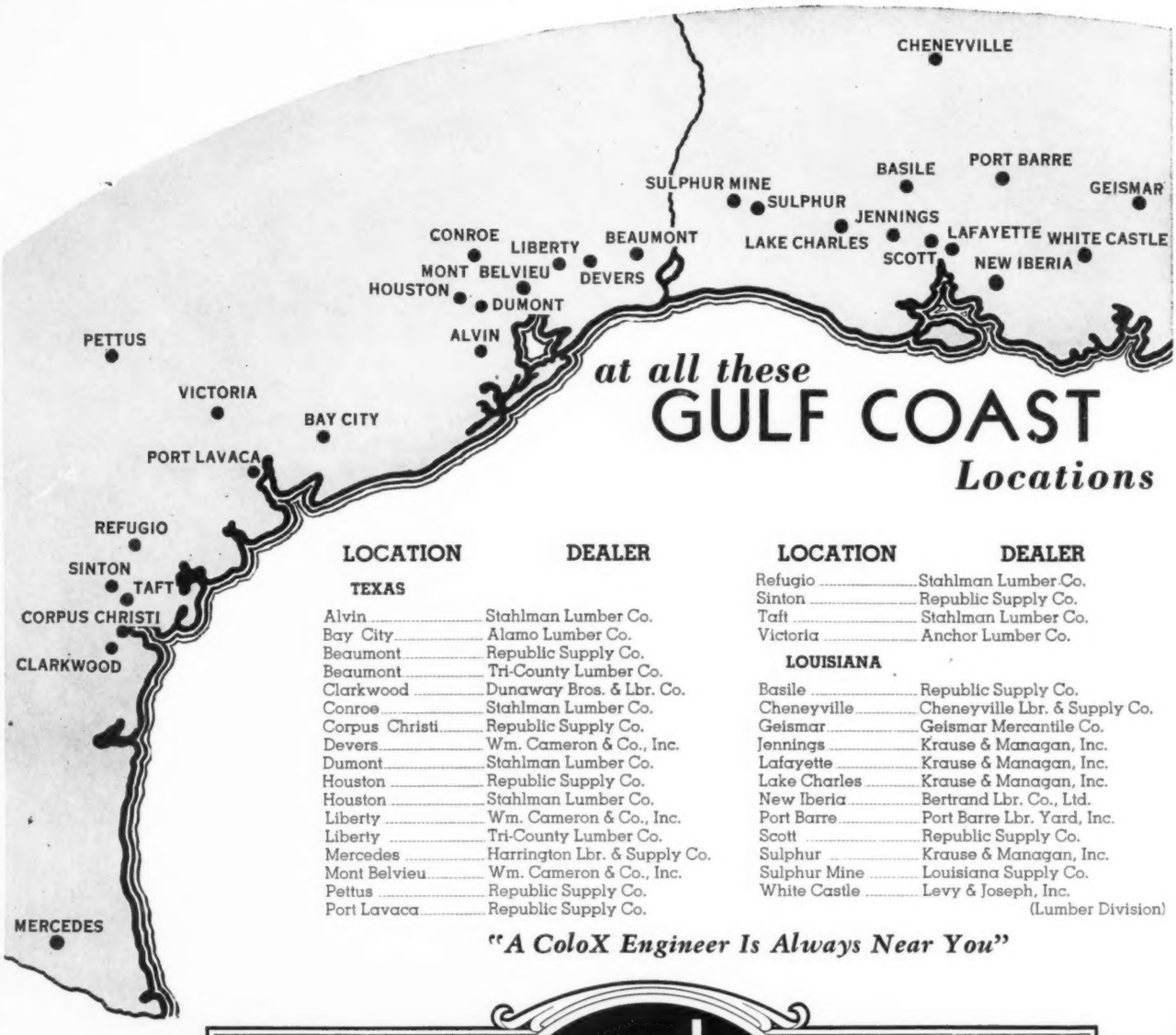

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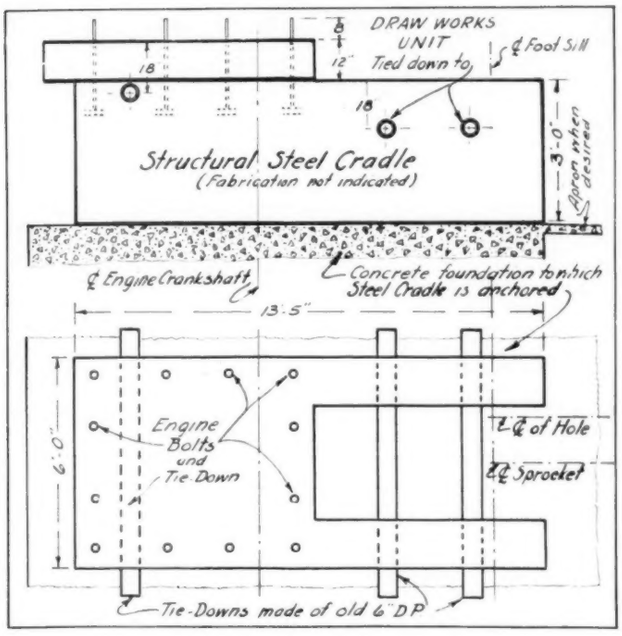


General design of the steel cradle. The foundations are made with anchor bolts for the cradle and with I-bolts for additional tie-downs for the equipment when needed.

By

WALLACE A. SAWDON

Petroleum Engineer, Los Angeles

Structural steel cradle supporting engine and unitized drawworks gives portability to heavy drilling equipment. Easily rigged up and dismantled, the assembly is transported on trucks and trailers, and has increased the economy of operation.

Portable Assembly of Unitized Drawworks and Engine

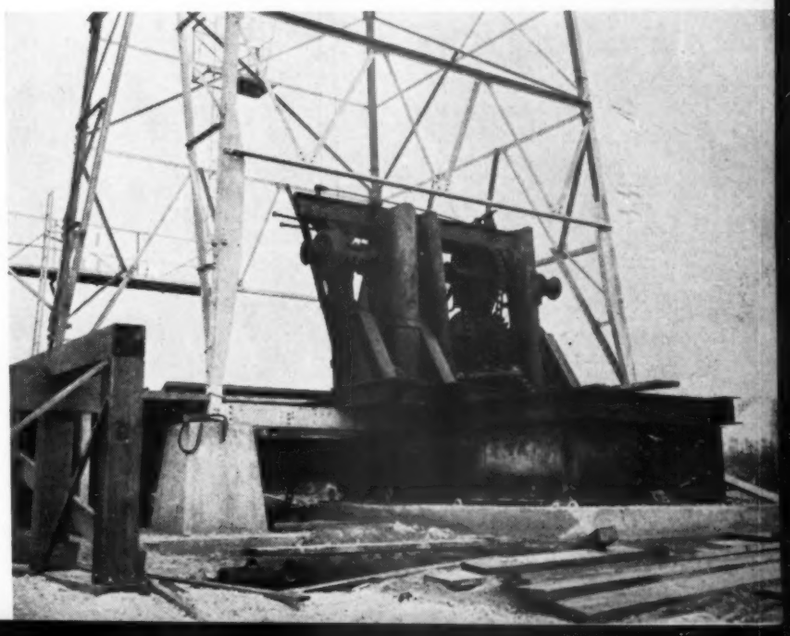
THERE are two distinct parts to the machinery installation for the drilling and completion of a well. One consists of the cellar and that portion of the superstructure which will be continued in service after the well is on production; the other consists entirely of equipment used for the drilling and completion of the well. After the well is completed this latter equipment should be made available for use on other wells, but its economical transfer from one well to another has long been a problem, because the dismantling and re-erection of machinery such as drawworks and engines have entailed the utilization of considerable time and material.

Complete portability of drilling equipment is naturally desirable and the development of portable hoists and drawworks has made possible the rotary drilling of wells to depths greater than 4000 ft. with units backed up to the derrick floor. These portable units have been mounted on trucks, on trailers, and on tractors, and have been driven by internal combustion engines and by electric motors. Since they are operated on their own mobile beds, there is, of course, a limit to their performance; but the results obtained with such equipment under certain conditions have unquestionably been most satisfactory as well as very economical.

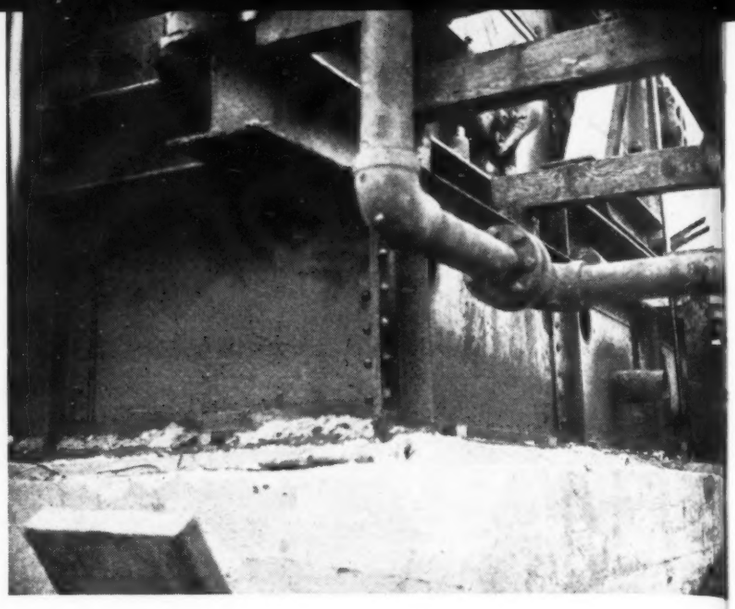
Other portable equipment of a similar nature is mounted on skids and is slid off onto the derrick floor. In all cases, rotary drive attachments are readily adjusted and with some types sand reels are provided.

For deep drilling where high pressures may be encountered and long strings of casing must be handled, the heavy equipment developed for the purpose must be used. Some of the earlier deep wells in California were drilled with a removable type of engine foundation; but such foundations were not found suitable. The two-wall type has been used extensively but most operators now favor the solid concrete block foundation.

During the past few years, considerable attention has been focused on the development of engine and drawworks mountings that would cut down dismantling and erection time and provide the maximum amount of salvage. A concrete foundation is considered desirable in all cases but since such a foundation can be prepared well in advance and is not



The drawworks unit being slid into place on the cradle, which has been set on the concrete foundation ready for grouting.



One 6-in. (drill pipe) tie-down is shown in place ready for tying down the drawworks unit. I-bolts are also set in the concrete to provide additional anchoring of the equipment to the foundation.

salvable property anyway, it presents no obstacle to the portability of the drilling equipment itslf.

The maximum portability for rotary rigs capable of drilling to any depth now necessary has probably been procured by the Union Oil Company in the design of a unitized drawworks and engine assembly that is readily transportable from one location to another. The assembly consists of a structural steel cradle, a drawworks unit and the engine as illustrated in the accompanying drawing and photographs. The cradle supporting the drawworks and engine is anchored to a concrete foundation previously constructed to standard specifications.

This unitized assembly offers economies in transportation and in setting-up and tearing-down time. After a well has been completed, this equipment can be torn down, transported to a near-by location and set up in one day. The engine is first unbolted from the cradle and skidded off onto a trailer, after which the tie-downs of the drawworks unit are removed and the unit skidded onto a truck. The cradle is then taken off the concrete foundation and loaded on a trailer.

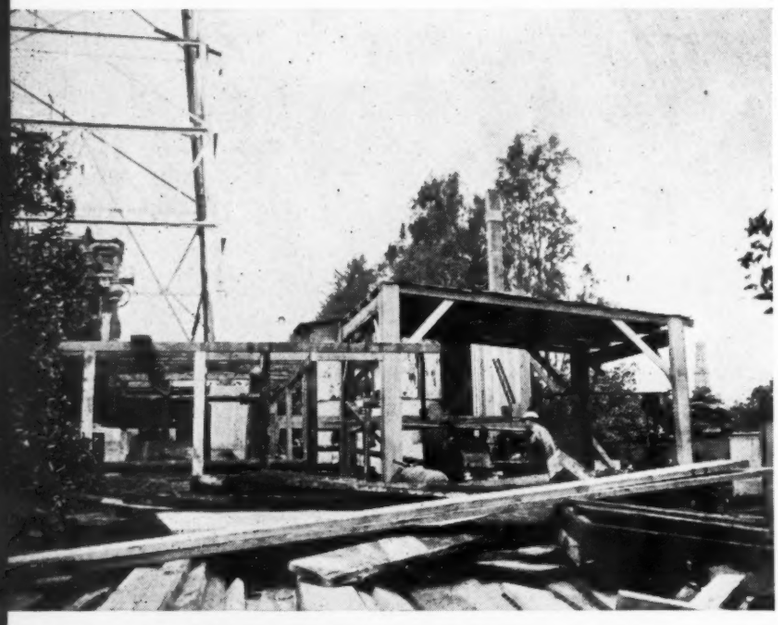
As can be seen in the illustration, the drawworks unit is a complete, permanently welded assembly with jack-pot braces securely constructed in place. The skid is made up of 10-in. H-beams and supports a drawworks of the size necessary for the operation contemplated. The unit is tied down securely to two tie-downs consisting of 6-in. drill pipe, which extend across the cradle.

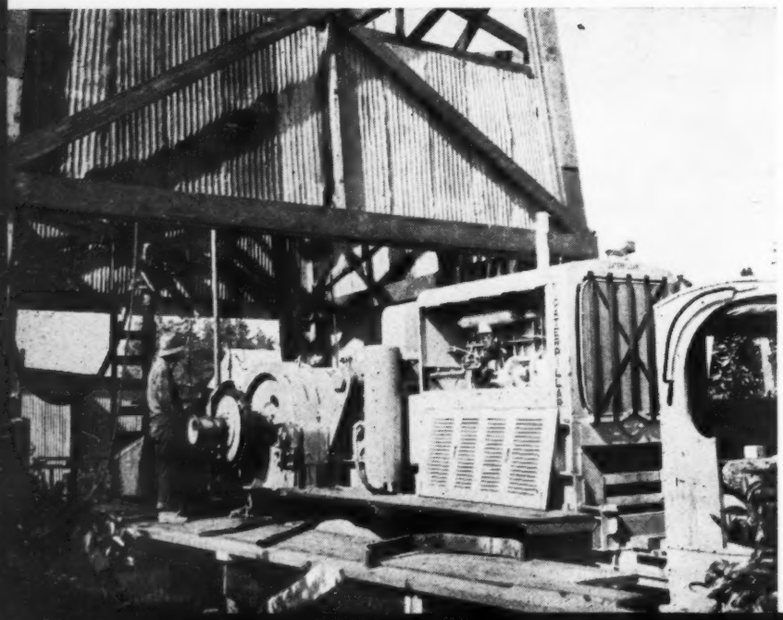
The assembly is made for a twin cylinder steam engine, which is readily bolted in place. During the actual drilling of a number of wells, the performance has been found to be at least equal to that of the same engine supported by an individual block-type foundation.

When installing this portable assembly the cradle is anchored to the foundation, which has been constructed with anchor bolts ready to take the assembly. The drawworks unit, which has no headboards but uses only space for alignment of jack posts, is then skidded into place and the brake and jack post tied down, after which the engine is slid into position and bolted down. The cradle itself is, of course, grouted to the concrete foundation.

In addition to the unitized assembly, a portable steel mud tank is provided with a vibrating screen mounted on its rim. The mud pumps are transported in the usual manner when moving from one location to another.

The unitized assembly is adaptable to all surface conditions and to any drilling requirements. Construction of the cellar may be of either the deep or shallow type, according to the drilling procedure to be followed. There is no question of salvage, since the assembly is a complete unit in itself that is used over and over again in its entirety.





Left (above)—In the process of rigging up—the engine and drawworks unit are in place on the cradle at the extreme left. The pump can be seen set below the derrick floor level. On the extreme right is the portable mud tank with vibrating screen.

Left (below)—A portable drilling unit mounted on truck and driven by a gas engine has been backed up to the derrick floor for rotary drilling this well to about 3000 feet.

Vapor-to-Liquid Heat Exchangers and Condensers

By
R. H. TURNER

IT will be endeavored in this article, a sequence to the article on "Liquid-to-Liquid Heat Exchangers",[1] to discuss as fully as space will permit vapor-to-liquid heat exchangers and condensers. Mechanical features of design of units of this particular type first will be treated, after which the thermodynamics involved will be analyzed and discussed rather in detail by the assumption of hypothetical problems, which will be rendered to solution. In these problems the oil vapor will be widely different in boiling range and the temperature and pressure conditions will vary materially. By such variations the correctness of the solutions can be more conclusively shown.

Vapor-to-liquid and liquid-to-liquid units are practically the same as far as the cooling medium is concerned. The latter type of units has been discussed in a previous article, consequently very little will be said concerning the cooling medium.

In the selection of gasoline condensers where usually there is a large amount of condensate to be handled in the units, it is very important to provide for the unimpeded draining of this condensate. In the case of the single condenser this can be more effectually accomplished by installing the unit vertically as shown in Fig. 1. The gasoline vapors enter the top shell nozzle and the condensate as it is formed is free to flow to the bottom of the shell of the unit and thence out the lower shell nozzle. This is a very efficient type of unit due to the fact that when the condensate is formed it has a tendency to adhere to the outside surfaces of the tubes to their full length, rendering effective the entire tube surface. The sweeping action of the vapors also materially aids in this full length, rendering effective the entire tube surface. The bottom of the condenser and leaves at the top, giving a 100 percent true counter-current flow with the complete log mean temperature difference being effective.

Almost invariably in the case of a single unit of this type, condensing gasoline of 50 deg. API and greater and using water at ordinary temperatures for condensing and cooling, such a single-pass arrangement on the water is imperative. This is due to the fact that a 5-deg. approach of the condensate to the water is usually economical and with such a close approach, a multipass arrangement within the tubes for the water would result in temperature crossing of the shell and tube mediums, rendering a large portion of the condenser useless. By this is meant that in the latter case there would be points in the lower part of the condenser where the water would be at a higher temperature than the temperature of the gasoline condensate that it is endeavored to cool.

This can be brought out more clearly by reference to Fig. 2. Gasoline vapors are entering the top shell nozzle at 320 deg. fahr. and are to be condensed and cooled to 85 deg.

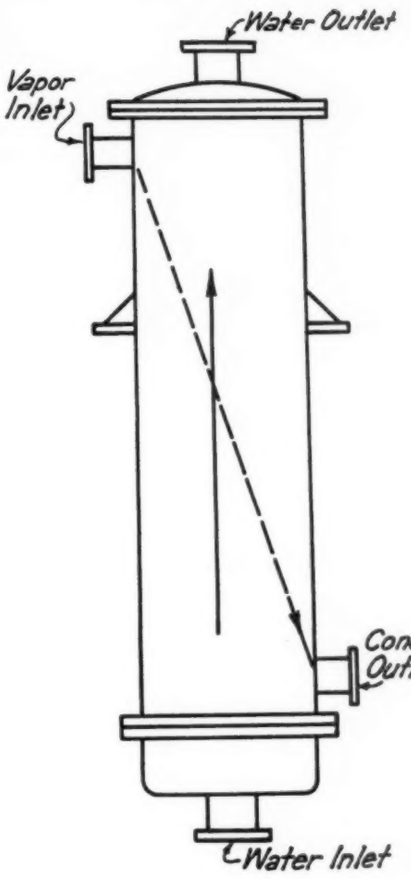


Fig. 1. Vertical gasoline condenser.

fahr. by the use of water entering a two-pass condenser at 80 deg. fahr. and leaving at 110 deg. fahr. With this rise in temperature of 30 deg. fahr. of the water, its temperature at the end of the first pass, which is at the bottom of the condenser, and entering the second pass would be approximately 95 deg. fahr., or ten deg. fahr. hotter than the temperature of the gasoline condensate in the shell and around the tubes at this point; however, this is not strictly true, but it brings out what is meant by temperature crossing.

It is only in a very few cases where the necessary condenser capacity is so small that a single vertical unit can be employed. It might be asked why if a single vertical unit will suffice for a given capacity is it not possible to use two, three, or four vertical units placed in parallel? It is true that this could be done very easily as far as the condensers themselves are concerned, as the velocity and the specific volumes would be the same, consequently the heat transfer rate and the pressure drop would of necessity have to be the same. However, the factors that would render such selections undesirable would be the expensive sub-structures necessary for supporting the units and the prohibitive number of fittings and amount of piping necessary for connecting a group of parallel condensers, over what would be required to install a battery of condensers properly placed in series one over the other, as shown in Fig. 3.

This is the condenser arrangement that usually will be encountered. The shell nozzles can be placed in the center of the shells as shown, employing a half-and-half pass arrangement on the vapors, or single nozzles can be placed at each end of the shells, making the units single-pass in the shell. Either arrangement will not materially affect the heat transfer rate or the pressure drop as the vapor velocity and length of vapor travel will be practically the same in both cases.

[1] "Liquid-to-Liquid Heat Exchangers," by R. H. Turner, *The Petroleum Engineer*, December, 1935.

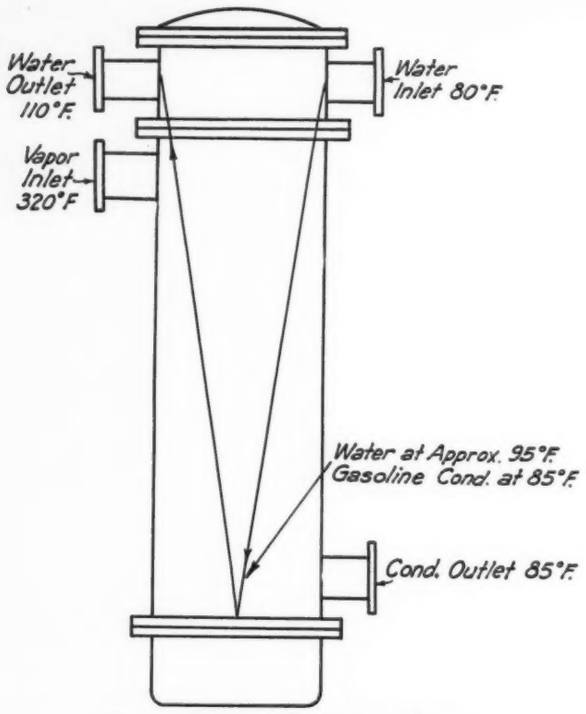


Fig. 2. Vertical gasoline condenser.

In any of the above condensers that have been mentioned, it might be said at this point that protecting plates should be installed over the tubes directly exposed to the impingement of the incoming vapors. This plate should conform to the curvature of the shell and should be perforated with holes so as not to render partially ineffective the surfaces protected. Such a plate serves still another purpose in that it tends to diffuse the incoming vapors around the entire tube element and render completely effective the tubes on the opposite side of the tube element from the inlet nozzles.

An unlimited amount of time and space could be given over to a discussion of the many types of shell baffles used in condenser construction to give an increased vapor velocity, thereby increasing the heat transfer rates obtainable, which in turn also increases the pressure drop. There is very little advantage to be gained by one type over the other. There is more consideration to be given concerning this point to the kind of vapors being treated, together with the amounts of condensation occurring, than there is to the particular advantages of one type of baffle over the other when one will give the same results as the other. When exchanger manufacturers differ materially from one another in making selections for a given set of specifications, it is usually due to a cumulation of other effects, either given or assumed, and not to the type baffles used in treating the shell vapors.

In making the above statement, it is made upon the assumption that the vapors being treated are flowing partially parallel to and partially perpendicular to the tubes in the tube element. Where the vapors and condensate flow 100 percent across the tubes, a materially greater heat transfer rate can be attained, with usually a lower pressure drop, due to the length of travel of the vapors being decreased and the length of travel of the vapors being a determining factor in computing pressure drop.

Theoretically the heat transfer rate for gas and/or vapor cooling can be increased for 100 percent cross tube flow over 100 percent parallel tube flow in accordance with the below formula:

$K_1 = K_2 \times (1 \text{ plus } D/P)$

$K_1 =$ transfer rate cross flow

$K_2 =$ transfer rate parallel flow

$D =$ diameter of tubes in inches

$P =$ pitch of tubes (distance in inches between centers).

Suppose parallel transfer rate is 40 B.t.u./sq.ft./deg. L.M.T.D.; the diameter of tubes in tube element 1 in. O.D.; and the pitch of tubes 1¼ inch.

Then $K_1 = 40 \times (1 \text{ plus } 1/1.250)$

$K_1 = 40 \times 1.80 = 72$ (for 100 percent cross-flow).

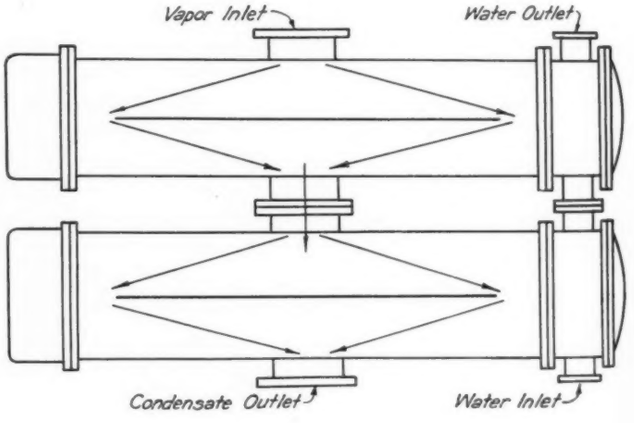
The value 1.80 is purely theoretical and the full increased rate can hardly ever be attained and is never used by any manufacturers; however, a value of 1.50 can be realized. It should be borne in mind that the above value is the increased transfer rate for only the vapor- or gas-cooling heat component in the total heat to be extracted in the condenser. In some cases where the major duty in a set of units is comprised of this component it will make a material difference in the total sq. ft. necessary for proper performance. On the other hand, from the same consideration, where the gas cooling heat component forms only a small part of the total heat, not very much can be gained by the cross-flow as outlined. It can be seen from the above that every condenser problem has of necessity to be treated separately and individually from this standpoint, as well as from several others.

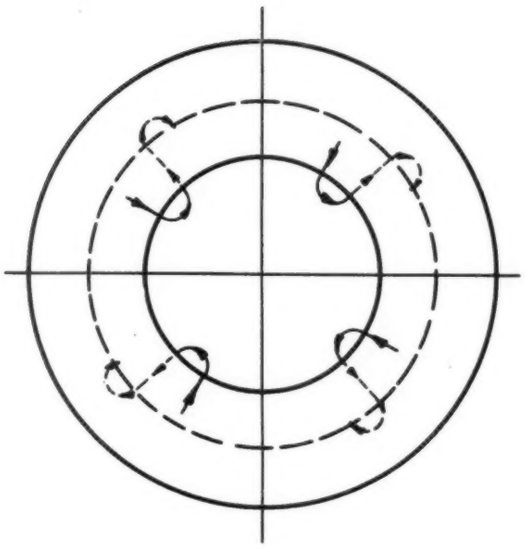
The disk-and doughnut type of baffle is one that is quite popular for condensers and gas coolers in a number of different services. These baffles, also known as solid and ring baffles, can be more clearly understood by reference to Fig. 4. This type of baffle is as efficient as any other type for general uses; however, the disks are more difficult to be held in place rigidly, due to a smaller number of tie-rods passing through them. This is hardly a consideration, as the disks are within the tube element and are never touched by the weight of the tube element in being removed for cleaning or other purposes.

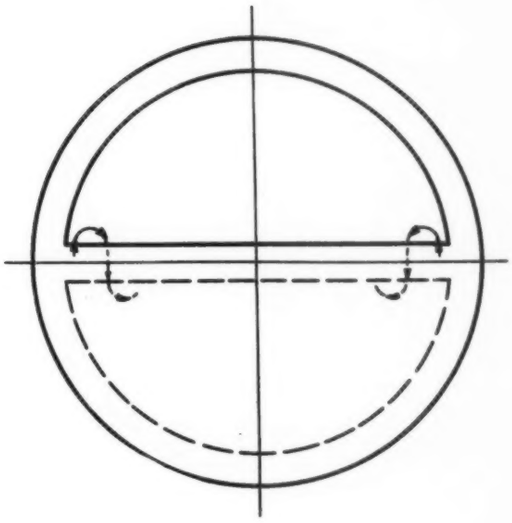
Another type of baffle used quite extensively is the half-moon type, which is as shown in Fig. 5. Still another type of baffle is the orifice type. In this type baffle, between the tube holes are drilled orifices through which pass the vapors and condensate. This type baffle is used more usually in units where the tubes are smaller in diameter than 1 in. O.D. It is claimed that this type of baffle will give the greatest amount of turbulent flow with a minimum amount of pressure drop, but this contention is open for refusal.

As has been previously stated, the shell vapor nozzles can be placed in the center of the shell. This type of construction

Fig. 3. Gasoline condensers in series.







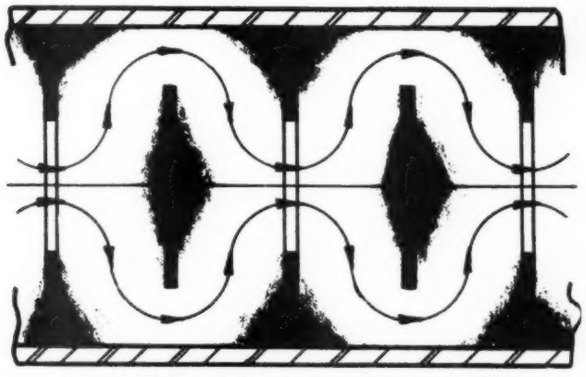


Fig. 4. Disk-and-doughnut exchanger baffles.

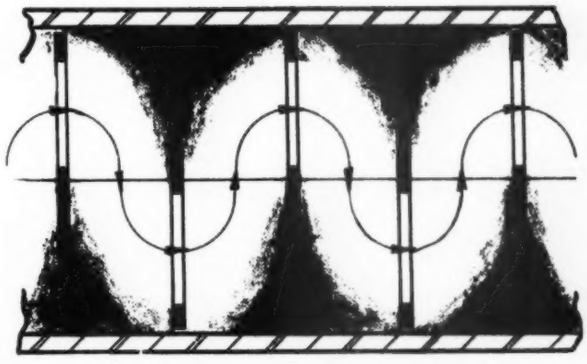


Fig. 5. Half-moon exchanger baffles.

usually is more desirable from the standpoints of ease of installation and symmetry. Units so equipped and installed will be symmetrical with bubble towers and rundown lines and will present a much neater appearance as a whole; also, under the conditions of a material change in expansion of one steel shell over that of the others does not have to be taken materially into consideration.

In this type of selection and construction careful consideration should be given to the horizontal vapor baffle construction, as shown in Fig. 6. This type is the single baffle construction and when used should be never less than 3/8 in. in thickness. There usually will be a negligible amount of heat shortcircuiting across this baffle, except in the most extreme cases of difference in temperature from one pass to the other, and in the most of these cases the temperature difference would be even too great to be incorporated in a single floating head construction. The details of construction of this type of horizontal baffle is shown clearly in sketch.

There is another type of horizontal baffle construction that is known as the parallel baffle type. In this construction two center parallel baffles are used of considerably less thickness and the four lengthwise edges slide into four corresponding tight-fitting grooves in the shell. This is a very efficient type of construction and is to be desired, especially in two-pass shell, liquid-to-liquid units of an exceptionally great tube length where the not liquid tight area is increased by the increase in tube length. The volume, or space, between the parallel baffles becomes filled with vapor or liquid, as the case may be, that has practically no velocity and is stagnant, consequently having practically no heat transfer rate for cross-flow of heat.

Editor's Note—This article will be concluded in the June issue.

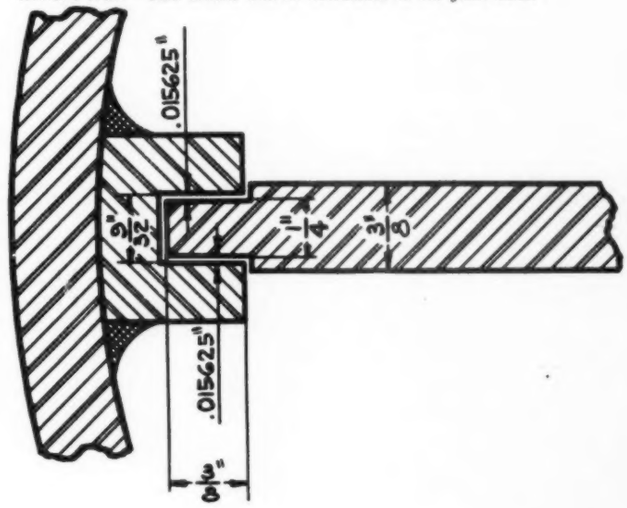
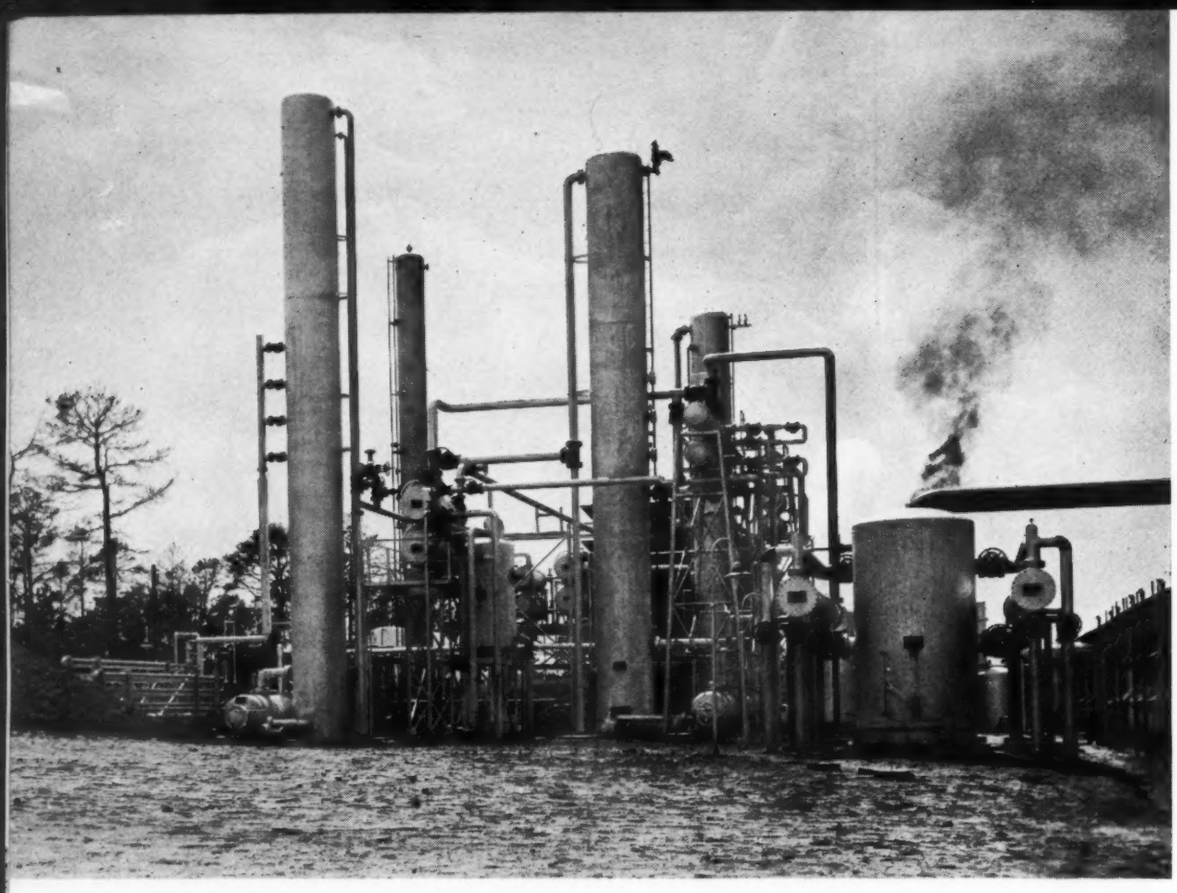


Fig. 6. Sealing channel for horizontal baffle plates.



View showing stabilizer column (left), recovery column (right), condensers, and intermediate scrubbers

New Equipment Enlarges Capacity of Gasoline Plant

By FRANK H. LOVE

RECENT installation of new equipment has increased the rated capacity of the Gregg Tex Gasoline Corporation's plant nine miles northeast of Longview, Texas, from approximately 12,000,000 cu. ft. daily to 17,000,000 cu. feet. The plant, receiving casinghead gas from 1760 wells in the East Texas field, is operated at 10 in. of vacuum and 260-lb. discharge pressure. It is a vapor-rectification type unit, and at present a blending natural gasoline of 18-lb. vapor pressure is being produced, the output averaging 30,900 gal. per 24-hour day.

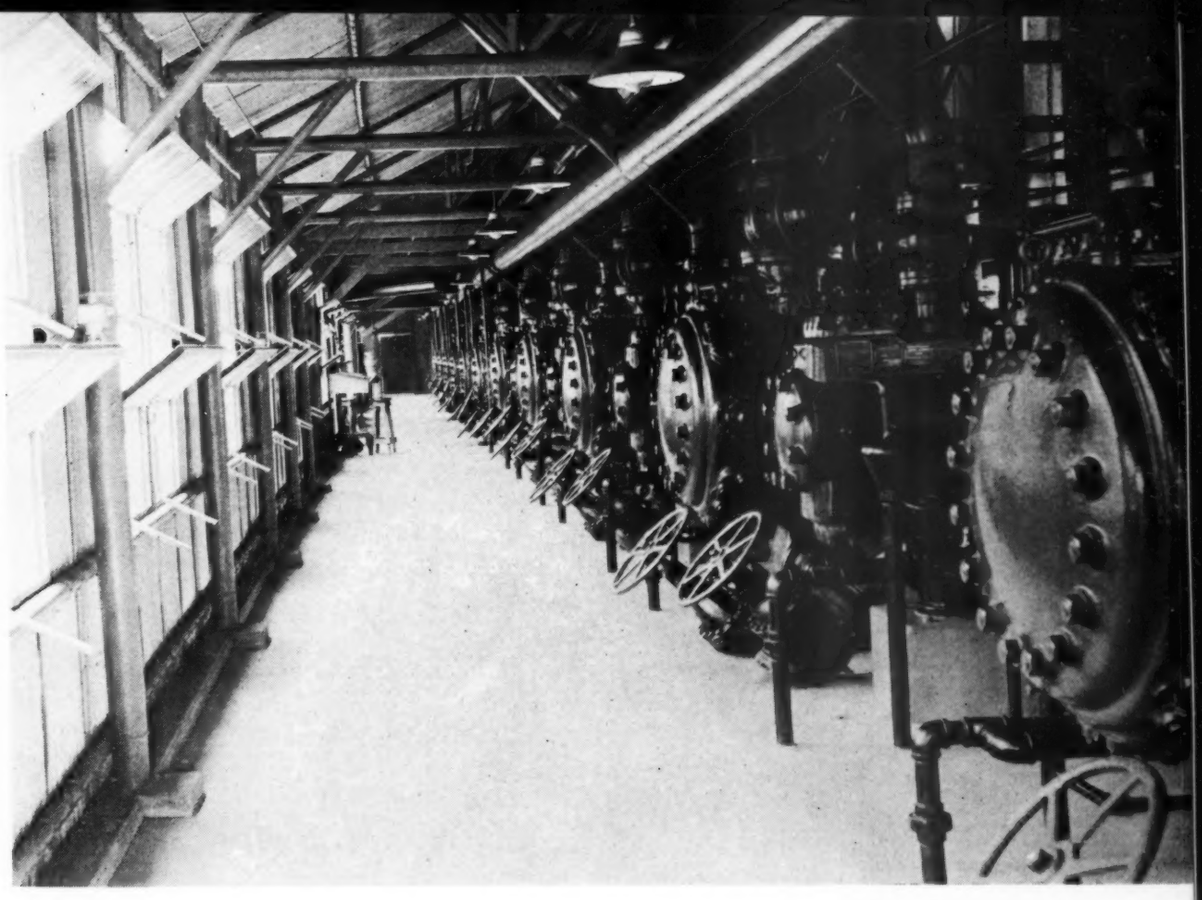
The enlargement program has involved the installation of latest type equipment, including five new 250-hp., two-stage, compressor units with 22 by 20 cylinders on the low-stage, and 10 by 20 cylinders on the high-stage; a new recovery column, 48 in. in diameter and 45 ft. high, equipped with a 30-in. by 10-ft. reboiler; two reflux condensers, 30 in. by 8 ft.; two 20-in. by 10-ft. precoolers; a reflux accumulating tank 48 in. by 8 ft. situated at the base of the recovery column; a 6 by 5 by 12 steam reflux pump; and an excess reflux storage tank 60 in. in diameter by 20 feet. Instruments controlling the recovery system consist of two residue flow meters, two reflux flow meters, an excess reflux meter and controller, a pressure meter and controller, one load equalizer, two reboiler controllers and meters, two top temperature recording thermometers, two dial temperature thermometers for the precoolers, a steam pressure gauge, and a residue pressure gauge.

A new stabilizer also has been added, 48 in. in diameter by 45 ft. 2 in. in height. Its accompanying equipment includes a 24-in. by 72-in. reflux condenser, and a 36-in. by 10-ft. reboiler; a 24,000-gal. raw gasoline storage tank; a 10 by 6 by 12 Simplex steam pump for boosting raw gasoline to the stabilizer; and an 8 by 7 by 18 Simplex steam pump for pumping reflux to the stabilizer. Gasoline coolers and heat exchangers on the stabilizer are the equipment previously in use but considerably enlarged.

The capacity of the two louver-type water cooling towers has been more than doubled. The one used for cooling engine jacket water has been increased in capacity from 900 gal. per min. to 1800 gal. per min., and that employed in connection with the distillation equipment from 1200 gal. per min. to 2700 gal. per minute. Water pumping equipment has been enhanced by four centrifugal steam turbine driven units, added to the two existing units of the same type.

In the steam plant three new 110-hp. boilers have been provided, making a total of six of that capacity, all operating at 150-lb. pressure, and equipped with automatic water controllers.

Prior to the new installations, old equipment, in addition to that already mentioned, consisted of five 400-hp. and two 440-hp. compressors. Cylinders are 26 by 20 on the low-stage side and 10 by 12 on the high-stage. One recovery column, one reboiler, one reflux condenser, one reflux accumulating tank, and two reflux condensers already were in use, of the same size and capacity as the new installations. In addition, the distillation equipment included two precoolers, 28 in. in diameter by four ft. long, a 6 by 5 by 12 reflux steam pump,



Gas is received by these compressors at 10 in. of vacuum, two-staged, and discharged at 260-lb. pressure

Vapor-rectification type unit of Gregg Tex Gasoline Corporation in East Texas field is capable of producing any grade of natural gasoline from 10-lb. to 30-lb. vapor pressure — Operating data show high efficiency.

and an 8 by 4 by 12 standby pump for reflux. Control instruments were a reflux meter and controller, a feed flow meter and controller, a reboiler meter and controller, a pressure meter and controller, a top temperature meter, and a pressure gauge for the stabilizer reflux accumulator.

The new storage tanks for raw gasoline have made unnecessary the tankage previously in use, and one of these vessels is now being utilized as a separator tank for the water wells, the other as storage for water used at the plant dwellings. Four 24,000-gal. tanks provide total gasoline storage of 96,000 gallons.

Gas is received from the field at 10 in. of vacuum and before entering the low-stage compressor passes through a 96-in. by 16-ft. scrubber. After being compressed to 35-lb. pressure it is discharged through two 72-in. by 10-ft. scrubbers and a cooler prior to entering the high-stage side of the compressor, from where it is discharged at 260-lb. pressure. It then passes through a 42-in. by 8-ft. scrubber, a precooler, and thence to the recovery column. The latter is operated at 250-lb. pressure at 270 deg. fahr. to produce a gasoline of 35-lb. vapor pressure. With the gasoline going to the raw storage, the stripped gas enters the residue lines at 170-lb. pressure and a portion thereof returned to the field to be used as fuel on leases, for drilling, etc., the remainder being utilized as fuel for engines and boilers at the plant.

The stabilizing unit is operated at 200 lb. pressure at 290 deg. fahr. to recover 18-lb. vapor pressure gasoline. The finished product is then sent to the storage tanks until needed, when it is boosted through a 4-in. pipe line by means of a Simplex steam pump to a 16-car rack at Gladewater and there loaded into tank cars.

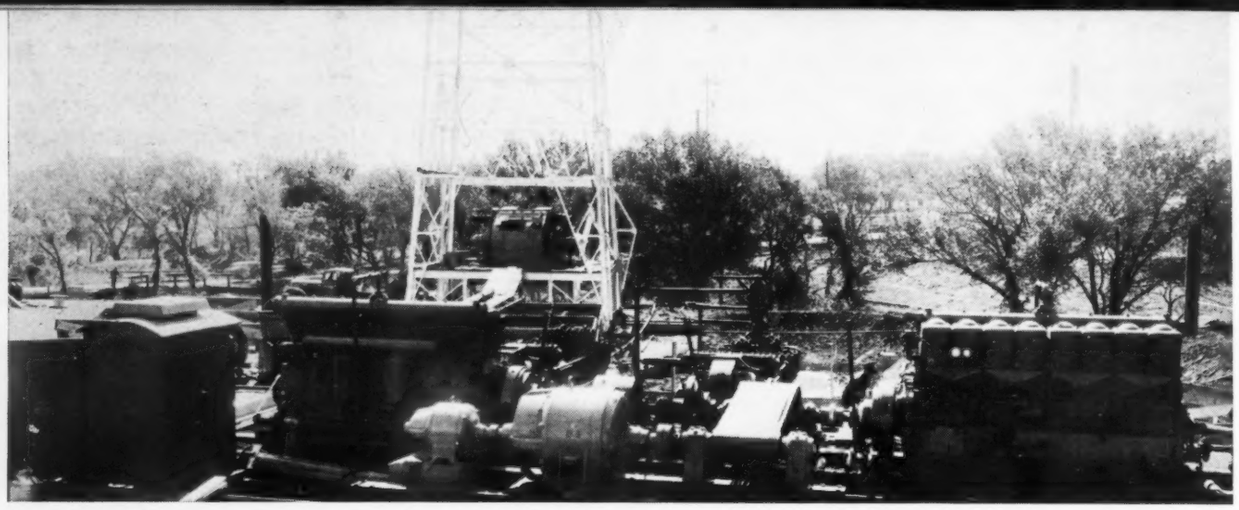
Three wells are necessary to meet water requirements, all being flowed by means of gas injection. Situated between the wells and water tanks are separators for removing the gas from the water. Two of the wells have been drilled to a depth of 450 ft., while one is a 300-ft. well. The water is extremely soft and requires no treating whatsoever. That from the 450-ft. wells shows an analysis 1.54 grains hardness, and from the 300-ft. well 1.33 grains hardness.

Gathering and residue lines, of which there are a total of approximately 140 miles, range in size from 20 in. on the intake headers down to as low as 2 in. on some of the field laterals. All field lines are provided with oil drips, placed at low spots. Residue lines range in size from 6 in. to 2 inches.

Gas in the East Texas field is sweet for the most part and a satisfactory gasoline recovery is possible. A typical sample of gas being received for processing at the Gregg Tex plant has been analyzed as follows:

	Mol Percent	Gal. Per M. Cu. Ft.
Methane	44.83	
Ethane	13.75	
Propane	22.74	
Iso-butane	5.21	
Normal butane	7.32	2.32
Pentanes	4.10	1.48
Hexane and heavier	2.05	.90
	100.00	4.70

The Gregg Tex plant probably has no superior now in East Texas from a standpoint of efficiency and can produce any grade of natural gasoline from 10-lb. to 30-lb. vapor pressure.



View from the generator side of equipment showing the drilling rig in the background; generator and exciter are connected to the engine line shaft by V-belts. The control cabinet can be seen to the left of the picture.

Electric-Mechanical Diesel Rig, Latest Drilling Drive, Operating in Oklahoma City Field

Generator-motor combination drives drawworks—while slush pumps are driven by V-belt from engine shaft

By LEO H. TOWERS

A COMBINATION electric-mechanical rig, the latest design in Diesel rotary rigs, has been installed in the Capitol extension area to the Oklahoma City field by R. B. (Cap) Fields on a well being drilled for the Black Gold Refining Company. Since the introduction of the Diesel engine in drilling, rigs generally have been classified as either Diesel-electric or Diesel-mechanical, depending on whether the engines drove generators to supply the drilling and pump motors or whether they drove the drawworks and pumps through some mechanical transmission media such as V-belts, chains, etc. This new type combination rig might be termed a half-electric and half-mechanical rig in that the generator-motor combination is retained for the drawworks, while the mud pumps are driven from the engine shaft by a V-belt drive.

Several distinct advantages claimed by each, the electric rig and mechanical rig, respectively, are obtained in this combination rig. By using the d-c. generator and motor for the drawworks drive the characteristics available in the steam engine can be more nearly obtained. The use of the variable voltage system[1] of control on the drilling motor gives this desired flexibility. The motor is quickly started, stopped, reversed, or accelerated, and has full torque at zero speed or in motion. This flexible control has been the chief advantage of the electric rig over the mechanical. The lower cost of installation, which perhaps is the chief advantage of the mechanical rig, also is partly realized in this new rig. By using the mechanical hookup of mud pumps the expense of one generator and one motor is saved. In this saving the cost of the rig will exceed the cost of a straight mechanical rig only by about 30 percent (power equipment only considered). The loss of power between the engine and pump also is believed to be less on this V-belt drive than through a generator-motor combination. Thus the combination rig tends to bring the initial cost of equipment more in line with the straight mechanical rig and yet retain the flexibility of the electric rig for the hoisting power.

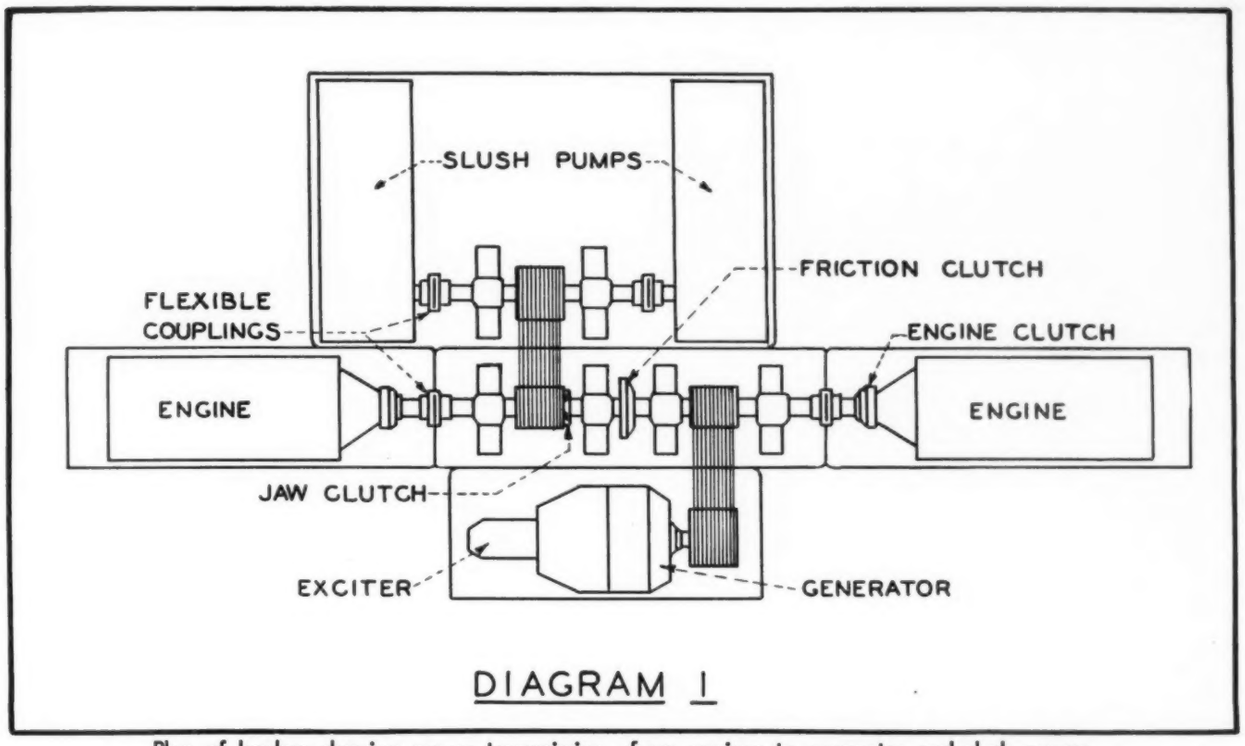
The prime movers on this well consist of two 8-cylinder, 9-in. by 10½-in., 275-hp., 515 r.p.m. Atlas-Imperial Industrial type, fully-enclosed and dustproof, full Diesel engines mounted on 12-in. H-beam bases. These bases are bolted to either end of a similar base supporting the lineshaft assembly. Referring to Diagram 1, there are three friction clutches—one at each engine for engaging that engine with the lineshaft, and a third at the middle of the assembly to compound the power of both engines on the shaft. There is a single-jaw clutch on the pump sheave for connecting to the lineshaft. This engine assembly is approximately 100 ft. from the derrick floor.

Connected by means of a 19-string V-belt drive to this prime mover is an Allis-Chalmers 330-kw., 40-deg., 350-volt d-c. generator with a 25-kw., 125-volt exciter direct connected. These are mounted on a common base of welded steel framework with the sheave drum supported by pedestal bearings.

On the opposite side of the engine unit (side nearest derrick) are the two 7¾-in. by 18-in. Lucey duplex slush pumps mounted on a single steel skid. They are connected by flexible couplings to the jackshaft containing the pulley sheave and driven from the 15-string V-belt sheave on the engine assembly.

With the hookup just described either engine may be used to drive both the generator and pumps; also, one engine may be used on the pumps and one on the generator. Still another method and the one considered to be normal operation will

[1] See "Direct Current for Rotary Drilling," by W. C. Lane—*The Petroleum Engineer*, June, 1933, for a description of the variable voltage system.



Plan of hookup showing power transmission from engines to generator and slush pumps.

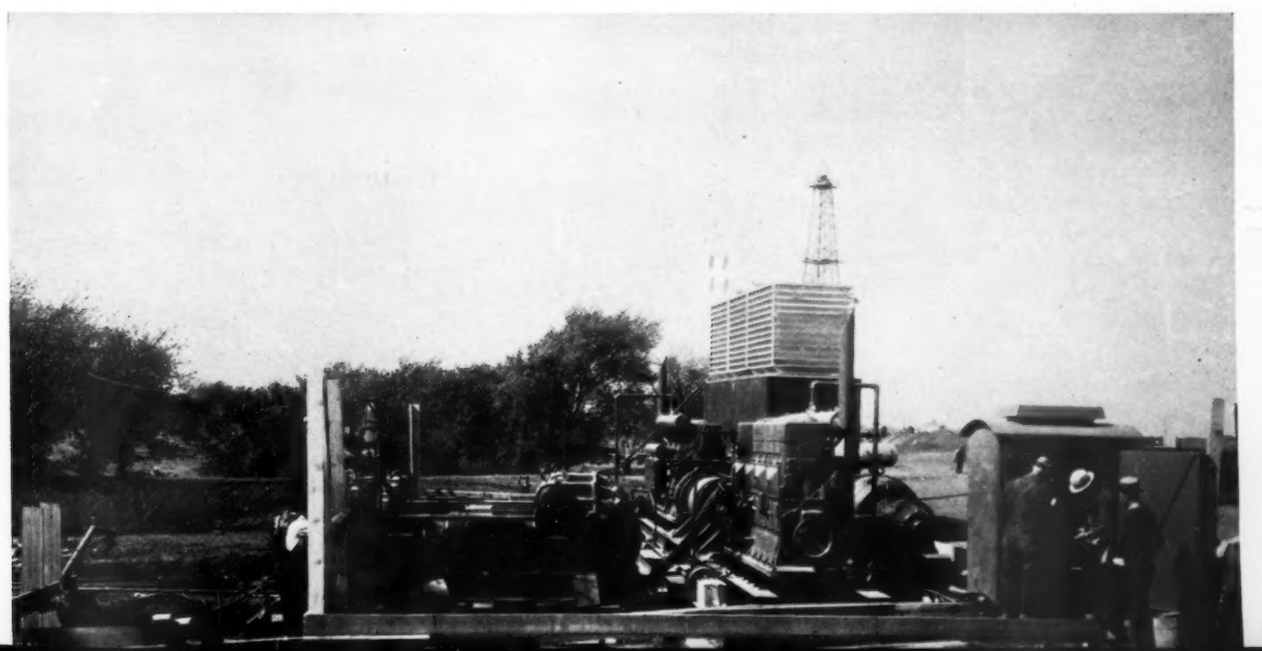
be to compound the two engines. With the engines compounded their power will be equalized to supply both generator and pumps. Under normal drilling considerably more power is required for the pumps than for the motor. When hoisting, the motor is given its maximum power by disengaging the jaw clutch (shutting down the pumps) and letting both engines drive the generator.

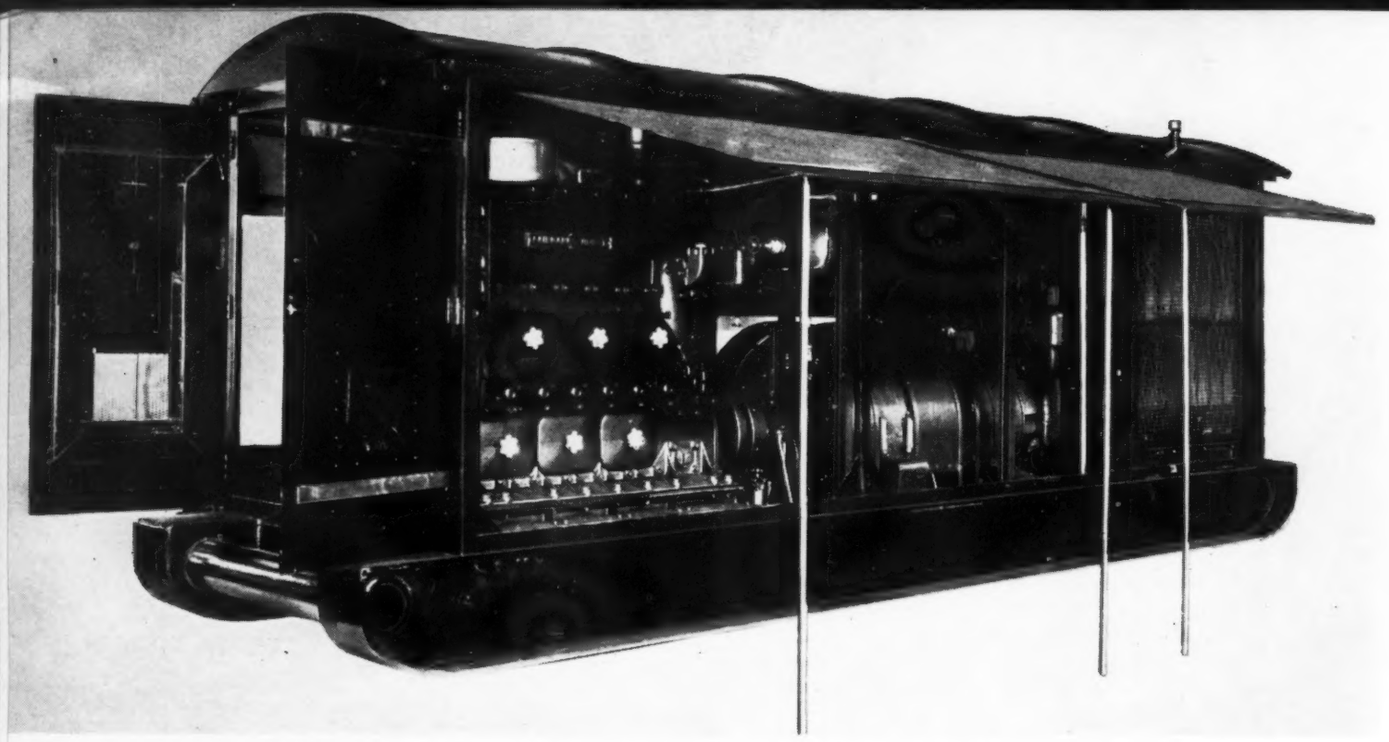
The drilling motor on the derrick floor is an Allis-Chalmers 400-hp., 350-volt, 1000 r.p.m. d-c. motor. It is totally enclosed to prevent danger from sparks and has a separately operated cooling fan for blowing air over the motor. Mounted on the same steel base and directly connected to this motor is a Falk gear reduction unit, which in turn has a chain drive to the drawworks. The motor is controlled from the driller's stand by and explosion-proof master drum.

The exciter will be used to supply the current for all auxiliary equipment such as the mud shaker, wash-down pump, and lights. A portable switchboard in a solid steel cabinet placed in the engine house contains the knife switches for throwing in this auxiliary equipment. Starting air for the engines is provided by a small air compressor direct-connected to a small gasoline engine and mounted on one end of the engine base. Each engine has its own circulating water pump driven by V-belt from the engine shaft.

The remainder of the rig equipment is of the usual heavy duty standard design for rotary drilling.

Side view of mechanical equipment showing pumps on the left of the engines; generator and control cabinet to the right; and cooling tower for engine water in the background.





One unit of the opposed piston generating set for drilling. Note the permanent metal canopy.

OPPOSED PISTON DIESEL

By
K. C. SCLATER

New completely unitized power generating units for deep drilling set standard for compactness and portability—Ward Leonard system used insures desired flexibility in meeting variable power requirements.

WHAT might well be termed the ultra-modern in power plants for deep oilwell drilling has just made its appearance. It comprises two identical units, each consisting of an opposed piston Diesel engine of 225-300 hp. direct-connected by combination flywheel flexible coupling to two electric generators of 140 kw. and 50 kw. respectively, complete with all auxiliaries and mounted on a heavy steel skid base. Each unit is enclosed in a substantial steel housing and in overall dimensions is 24 ft. long, 6 ft. wide, 8 ft. 6 in. high, and has a total weight of 40,000 pounds.

Especial interest attaches to this power plant because of the advanced engineering design, in which compactness, completeness, and portability have been combined to a degree not heretofore attained in oilfield equipment of this type. Among the features that command attention are: employment of the opposed piston type of Diesel engine, the first of its kind to be applied to oilfield service; adoption of the Ward Leonard system[1] of generating d-c. electric power, thereby providing extreme flexibility of power in drilling; the plant is so self-contained and anticipates all oilfield requirements to such an extent that it sets a new standard in oilfield power units for drilling.

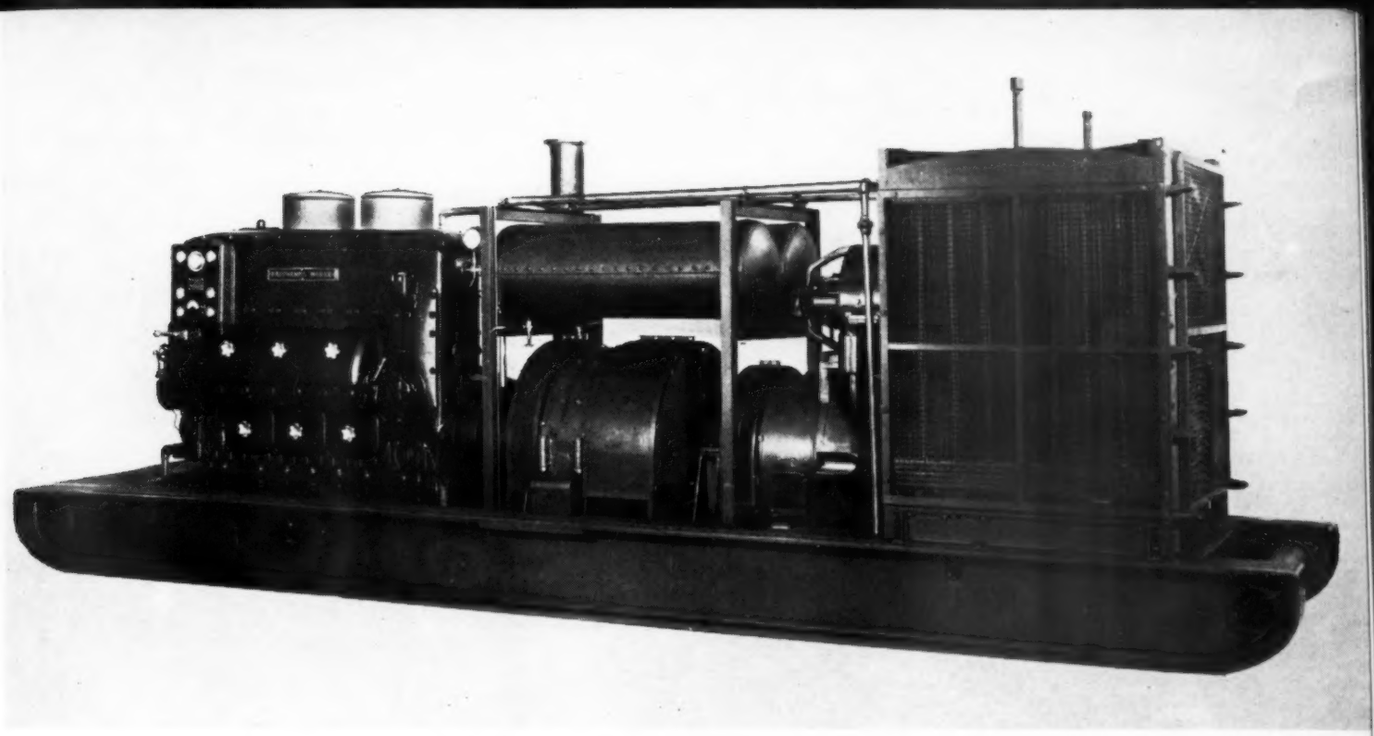
The engine in each unit is a Fairbanks Morse opposed piston Diesel of 900-1200 r.p.m. rated speed. At 900 r.p.m. the continuous rating is 225 hp., or 450 hp. for the two units. At 1200 r.p.m. the continuous rating is 300 hp. for each engine. During hoisting, 360 hp. is the maximum the generator will permit to be imposed on the engine. Each unit has a permanent metal canopy that can be kept either open or closed with the unit in operation, as shown in accompanying photographs.

Each unit has one G.E. 140-kw., 275-volt, d-c. generator, one 50-kw., 275-volt, d-c. generator, and one G.E. 25-kw., 125-volt exciter. In operation, the two large (140-kw.) generators are paralleled on the slush pump motors, and the 50-kw. generators paralleled on the drawworks motors for rotation. The exciters supply current for excitation and for auxiliaries such as lighting, the blower motors, wash-down pump, air-starting compressors, and vibrating mud screens.

During hoisting the two large generators are paralleled on the drawworks motors, which have a capacity up to the permitted load of 360 hp. on each engine.

The fuel system, which is the solid injection type with individual pumps, has a float reservoir from which the injection fuel system is fed. The main supply fuel tank is set about one ft. above the float reservoir. An oil filter (Puro-

[1] "Direct Current for Rotary Drilling," by W. C. Lane, *The Petroleum Engineer*, June, 1933.



View of one unit of power generating set without steel canopy.

DRILLING POWER PLANT

lator) of ample capacity is installed in the line between the supply tank and the float reservoir tank. From the float reservoir, which automatically obtains its supply from the supply tank, the fuel oil is passed through dual filters (Purolators) in the line between the float reservoir and injection pumps.

Air is supplied to the engines through two Burgess combination air filter and silencer units.

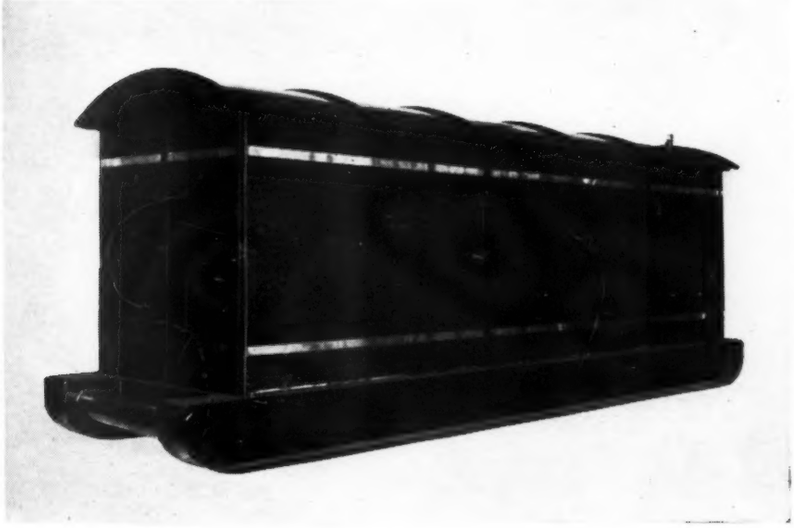
The fully-enclosed lubricating oil system is of the forced feed type and has two pumps, one for clean oil to engine and one for return oil. The return oil is pumped through a large size filter and into the radiator where it is cooled before being returned to the engine. All piping is of copper and all fittings of brass.

Air for starting, which is supplied by a small motor-driven compressor permanently mounted on the frame, is stored in two tanks, 20 in. by 60 in., equipped with gauges and permanent copper piping.

All wiring is laid in heavy conduit and is run to an entirely closed permanent metal terminal box, which can be locked to protect the heavy copper terminals. All terminals are plainly marked to avoid confusion when rigging-up.

Each unit has two large radiators, one for cooling the engine water and the other for cooling the lubricating oil. One motor drives both fans through a common shaft driven by a 7-string V-belt from the motor. Copper piping is used in the cooling system between the engine and radiator.

By adopting the opposed piston type engine it eliminates high piston speeds and permits employing high-speed electric generators, thus making for reasonably low first cost. In order to ensure low operating and maintenance costs large filters and well designed piping and connections provide for an ample supply of clean fuel oil, clean air, and clean lubricating oil to the engine. The portability and completeness of this plant should make it possible to rig-up with minimum trouble, time, and expense. Its operation in the field will be followed with more interest than usual.



One unit of the drilling power generating set with steel canopy entirely closed.

A Bureau of Mines Study of a "Bottom Hole" Sample from the Crescent Pool, Oklahoma

with Regard to Liberation of Gas, Expansion of the Oil-Gas Mixture and Energy Relations Involved in Flow[1]

By BEN E. LINDSLY[2]

Part 4

Mathematical Integration: For determining the indicated work of the 149° F. bottom-hole sample the path of expansion on the logarithmic diagram of fig. 13 may be considered without significant error to be along four consecutive straight lines, as follows:

1. The vertical line from the point $P = 2829$, $V = 1$, to the point $P = 2575$, $V = 1$.
2. The line A_1, whose equation is $P = 2575\ V^{-2.52}$, from the point $P = 2575$, $V = 1$, to the point $P = 1811$, $V = 1.15$, where line A_1 intersects line A_2.
3. The line A_2, whose equation is $P = 2175\ V^{-1.34}$, from the point $P = 1811$, $V = 1.15$, through the point $P = 894$, $V = 1.94$, to the point $P = 736$, $V = 2.24$, where line A_2 intersects line A_3.
4. The line A_3, whose equation is $P = 1578\ V^{-0.945}$, from the point $P = 736$, $V = 2.24$, to the point $P = 14.4$, $V = 144.1$, where line A_3 reaches atmospheric pressure.

The computation of the indicated work of the fluid, $144\left(P_1V_1 - P_2V_2 + \int_{V_1}^{V_2} P\,dV\right)$, is as follows:

From 2829 to 2575 lb./in.² abs. (reservoir to bottom-hole pressure):

$$144\{(2829 \times 1) - (2575 \times 1) + 0\} = 36{,}576 \text{ ft-lb.}$$

From 2575 to 894 lb./in.² abs. (bottom-hole to wellhead pressure):

$$144\left\{(2575 \times 1) - (894 \times 1.94) + \int_{1.0}^{1.15} 2575V^{-2.52}\,dV + \int_{1.15}^{1.94} 2175V^{-1.34}\,dV\right\} =$$

$$144\left\{(2575 - 1734) + \frac{2575}{-1.52}\left(\frac{1.15}{1.15^{2.52}} - 1\right) + \frac{2175}{-0.34}\left(\frac{1.94}{1.94^{1.34}} - \frac{1.15}{1.15^{1.34}}\right)\right\} = 310{,}450 \text{ ft-lb.}$$

From 894 to 14.4 lb./in.² abs. (wellhead to atmospheric pressure):

$$144\left\{(894 \times 1.94) - (14.4 \times 144.1) + \int_{1.94}^{2.24} 2175V^{-1.34}\,dV + \int_{144.1}^{2.24} 1578V^{-0.945}\,dV\right\} =$$

$$144\left\{(1734 - 2075) + \frac{2175}{-0.34}\left(\frac{2.24}{2.24^{1.34}} - \frac{1.94}{1.94^{1.34}}\right) + \frac{1578}{0.055}\left(\frac{144.1}{144.1^{0.945}} - \frac{2.24}{2.24^{0.945}}\right)\right\} = 1{,}097{,}770 \text{ ft-lb.}$$

TOTAL - - - - - - - - - 1,444,796 ft-lb.

sion on the logarithmic diagram of Fig. 13 may be considof interest in showing the relative importance over these pressure ranges of the work corresponding to difference in pressure head and the work resulting from expansion of the fluid:

Pressure drop, lb./in.² abs.	$144(P_1V_1 - P_2V_2)$, ft-lb.	$144\int_{V_1}^{V_2} P\,dV$, ft-lb.	$144\left(P_1V_1 - P_2V_2 + \int_{V_1}^{V_2} P\,dV\right)$, ft-lb.
2829 to 2575	36,576	0	36,576
2575 to 894	121,104	189,346	310,450
894 to 14.4	—49,104	1,146,874	1,097,770
2829 to 14.4	108,576	1,336,220	1,444,796

Checking the total by the use of $-144\int_{P_1}^{P_2} V\,dP$,

$$-144\left\{1(2575-2829)+\int_{1811}^{2575}2575^{\frac{1}{2.52}}P^{-\frac{1}{2.52}}\,dP+\int_{1811}^{736}2175^{\frac{1}{1.34}}P^{-\frac{1}{1.34}}\,dP+\int_{736}^{14.4}1578^{\frac{1}{0.945}}P^{-\frac{1}{0.945}}\,dP\right\}=$$

$$-144\left\{-254+\frac{22.567}{0.6032}\left(1811^{0.6032}-2575^{0.6032}\right)+\frac{309.49}{0.2537}\left(736^{0.2537}-1811^{0.2537}\right)+\frac{2422.4}{-0.0582}\left(\frac{14.4}{14.4^{1.0582}}-\frac{736}{736^{1.0582}}\right)\right\}=1{,}444{,}824\text{ ft-lb.}$$

The total is, therefore, substantially 1,445,000 ft-lb. by mathematical integrations.

Graphic Integration: In computing the indicated work of the 149°F. sample of bottom-hole oil by graphic integration the area between curve A, fig. 12, and the vertical axis may be divided into narrow strips, the dimensions of which may be determined conveniently from curve $A_1A_2A_3$, fig. 13, These strips may be vertical, corresponding to $P_1V_1-P_2V_2+\int_{V_1}^{V_2} P\,dV$, or horizontal, corresponding to $-\int_{P_1}^{P_2} V\,dP$. If the strips are not too wide they may be considered as trapezoids and their areas determined without appreciable error by multiplying their width by the arithmetical average of the length of their two sides. In selecting the width of strips to be used in the various parts of the

Table 7.—Computation by graphic integration of indicated work of quantity of bottom-hole oil occupying 1 cu. ft. at 2829 lb./in.² and 149° F. (45.8 lb. of fluid) expanding isothermally at 149° F. with flash liberation.
(See curve A, fig. 12, and curve $A_1A_2A_3$, fig. 13)

Pressure, P, lb./in.²	Average pressure, $\frac{P_1+P_2}{2}$, lb./in.²	Volume, V, cu. ft.	Change in volume, $\Delta V=V_2-V_1$, cu. ft.	Pressure X volume, PV	Work due to change in pressure head, $144\,(P_1V_1-P_2V_2)$, ft—lb.	Work due to Expansion, $144\frac{P_1+P_2}{2}\Delta V$, ft—lb.	Indicated work of fluid, $144\,(P_1V_1-P_2V_2+\frac{P_1+P_2}{2}\Delta V)$, ft—lb.	Subtotals of indicated work, ft—lb.	Cumulative indicated work, ft—lb.
1	2	3	4	5	6	7	8	9	10
2829		1.0000		2829					
	2702		0.0025		35,654	979	36,633		
2575		1.0025		2581.4				36,633	36,633
	2437.5		.0385		26,942	13,507	49,449		
2300		1.041		2394.3					77,082
	2150		.057		28,555	17,654	46,209		
2000		1.098		2196					123,291
	1850		.102		22,464	27,173	49,637		
1700		1.20		2040					172,929
	1550		.18		15,552	40,176	55,728		
1400		1.38		1932					228,656
	1250		.27		16,848	48,600	65,448		
1100		1.65		1815					294,104
	997		.29		11,606	41,630	53,236		
894		1.94		1734.4				310,707	347,734
	822		.33		4,594	39,067	43,661		
750		2.27		1702.5					391,001
	675		.51		4,968	49,565	54,533		
600		2.78		1668					445,534
	550		.59		−2,448	46,728	44,280		
500		3.37		1685					489,814
	450		.90		−3,312	58,320	55,008		
400		4.27		1708					544,822
	350		1.50		−3,312	75,600	72,288		
300		5.77		1731					617,110
	275		1.23		−2,736	48,701	45,965		
250		7.00		1750					663,075
	225		1.83		−2,304	59,299	56,995		
200		8.83		1766					720,070
	175		3.07		−2,736	77,357	74,621		
150		11.9		1785					794,691
	137.5		2.6		−3,960	51,480	47,520		
125		14.5		1812.5					842,211
	112.5		3.8		−2,520	61,560	59,040		
100		18.3		1830					901,251
	87.5		6.8		−7,560	85,680	78,120		
75		25.1		1882.5					979,371
	67.5		6.7		−3,672	65,117	61,445		
60		31.8		1908					1,040,816
	55		6.7		−2,448	53,064	50,616		
50		38.5		1925					1,091,432
	45		10.3		−3,888	66,744	62,856		
40		48.8		1952					1,154,288
	35		17.4		−4,896	87,696	82,800		
30		66.2		1986					1,237,088
	25		35.3		−6,336	127,080	120,744		
20		101.5		2030					1,357,832
	17.2		42.6		−6,480	105,509	99,029		
14.4		144.1		2075				1,109,521	1,456,861
					108,575	1,348,286	1,456,861	1,456,861	

Note: All pressures are absolute.

area, reference should be made to the curve on rectangular coördinate paper (curve A, fig. 12) as well as to the curve on logarithmic paper (curve $A_1A_2A_3$, fig. 13) to avoid selections that will place appreciable areas between the chords bounding the trapezoidal strips and the arcs of the actual curve.

Table 7 shows the calculations, based on graphic integration, of the indicated work of 1 cu. ft. of the bottom-hole fluid (measured at 2829 lb./in.² abs. and 149° F.), expanded isothermally at 149° F. To show the relative magnitude of the work due to difference in pressure head and the work due to expansion, over the various pressure ranges, vertical strips have been used for the integration. The table lists the values of 144 $(P_1V_1—P_2V_2)$ and 144 $\frac{P_1+P_2}{2}(V_2—V_1)$ (which is approximately equal to 144 $\int_{V_1}^{V_2} PdV$ for the expansion corresponding to each strip.

Column 9, table 7, shows the subtotals of indicated work for the pressure drops 2829 to 2575 lb./in.² abs., 2575 to 894 lb./in.² abs. and 894 to 14.4 lb./in.² abs.; column 10 shows the cumulative indicated work between 2829 lb./in.² abs. and each of the other pressures listed in column 1. It will be noted that the subtotals shown in column 9 agree closely with the indicated work for the same pressure drops obtained by mathematical integration and that the total obtained by graphic integration checks that based on mathematical integration within 0.75 percent. Even closer agreement could be obtained by using shorter pressure drops (narrower strips) for the graphic integration.

Comparing the figures in columns 6 and 7, table 7, it will be noted that at the beginning of the expansion the work 144 $(P_1V_1 — P_2V_2)$ due to change in pressure head is the major term. As the expansion proceeds, 144 $(P_1V_1 — P_2V_2)$ decreases in value, finally becoming negative, and 144 $\frac{P_1+P_2}{2}\Delta V = 144\int_{V_1}^{V_2} PdV$ is of increasing importance. If an incompressible liquid (approximated by water) were flowing (without the action of external forces) all the indicated work of the fluid would be represented by the term 144 $(P_1V_1 — P_2V_2)$, because dV would be zero. If an ideal gas (very roughly approximated by dry natural gas) were flowing without change of temperature all the indicated work would be represented by 144 $\int_{V_1}^{V_2} PdV$, because under isothermal conditions P_1V_1 and P_2V_2 would be equal. If the bottom-hole oil here considered were flowing under the influence of a pressure differential from 2829 to 14.4 lb./in.² abs., at the beginning (high-pressure end) of the flowing process the fluid would behave substantially as a liquid, but as its volume increased because of reduction in pressure its behavior would become more like that of a gas.

Estimated Isothermal PV Curves for Reservoir Fluid

Curves $A_1A_2A_3$ and $B_1B_2B_3$, fig. 13, do not represent pressure-volume relations for reservoir fluid because the bottom-hole oil, which filled the sampler, had lost some gas in flowing from its original position in the sand to the well bore under the influence of a difference in pressure. Although definite proof is lacking the weight of evidence indicates that the reservoir fluid was saturated at 2829 lb./in.² abs. and 149° F. In any event, development and study of curves based upon that assumption will be of interest.

Curves G and H, fig. 13, which represent estimated isothermal pressure-volume relations for reservoir fluid at 149° and 70° F., respectively, were developed by a method suggested by Cattell[16] after completion of the experimental work on which this paper is based. If these curves were referred to the origin used for those representing bottom-hole fluid curve G would fall very close to curve $A_1A_2A_3$, and curve H would lie near curve $B_1B_2B_3$; therefore the pressure scale for curves G and H has been placed one section higher on the logarithmic chart. In presenting these curves based on estimates for reservoir fluid the writer wishes to emphasize that the primary purpose of this paper is to suggest methods of attack rather than to present an exact analysis of conditions in the Crescent pool well.

Curves G and H represent the pressure-volume relations at 149° and 70° F., respectively, of the same mass of reservoir fluid—the mass occupying a volume of 1 cu. ft. at 2829 lb./in.² abs. and 149° F. Therefore, estimating that the reservoir fluid will shrink 4.3 percent when the temperature is reduced from 149° to 70° F. at the reservoir pressure[17] curve H (for 70° F.) starts at the point $P = 2829$ lb./in.² abs., $V = 0.957$ cu. ft., whereas curve G (for 149° F.) starts at $P = 2829$ lb./in.² abs., $V = 1.00$ cu. ft.

Referring again to fig. 13, curves C and D represent the pressure-volume relations of the gas phase of the 149° and 70° F. bottom-hole samples, respectively, and curves E and F represent the corresponding pressure-volume relations of the respective masses of gas that would have to be added to the bottom-hole oil samples to bring them to reservoir-fluid composition. That is, for example, E is a pressure-volume curve for the gas, in addition to the gas liberated from the 149° F. bottom-hole sample represented by curve $A_1A_2A_3$, that would be evolved in flash liberation at 149° F. from a sample of reservoir fluid of sufficient volume to give a liquid phase at 2575 lb./in.² abs. (bottom-hole oil-saturation pressure) of the same mass and composition as that bottom-hole sample.

Curve G was constructed from curve $A_1A_2A_3$ by means of curves C and E, and curve H was constructed from curve $B_1B_2B_3$ by means of curves D and F. The premises used and procedure followed in drawing these various curves are described in Appendix A.

[16]Cattell, R. A., chief engineer, Petroleum and Natural-Gas Division, Bureau of Mines.

[17]Interpolation from the data cited in footnote 13 gives the reservoir fluid (weighing 45.2 lb./cu. ft. at 149° F.) a coefficient of expansion and a specific gravity at 60° F. of 0.00057 and 0.764, respectively. On this basis, the volume of a given mass of oil at 70° F. is $\frac{1+(.00057\times 10)}{1+(.00057\times 89)}\times 100 = 95.7$ percent of its volume at 149° F.

Wages and Taxes Big Factors in Cost of Producing Petroleum

A survey of petroleum production costs recently published by the Petroleum Administrative Board shows that more than one-half total operating costs in petroleum production represent wages and taxes.

The survey, which covered 1934, reveals costs per bbl. of company-interest oil as 22.8 cents that year. Of this total 38.3 percent went to labor, including superintendence, and 17.1 percent was paid out in the form of taxes to federal, state, and local governments.

While the report shows no total amounts paid by oil companies, it has been estimated that wage payments in the production branch amounted approximately to $228,610,000 in 1934.

The data further reveals that taxes paid by oil companies in connection with production alone amounted to more than costs of repairs and maintenance, of tools and supplies, and of insurance.

Fundamentals of Well Counterbalancing

By

EMORY N. KEMLER

This article deals with the fundamental mechanics of counterbalancing. So far as balancing effect is concerned, it is shown that there is no appreciable difference between the two types of counterbalance, beam and rotary.

THE sole purpose of a counterbalance is to make the load on the prime mover steadier. It should always be kept in mind that energy stored in a counterbalance in one part of the stroke is always available for doing work in some other part of the stroke; in other words, the net power or work to operate a counterbalance is zero when measured over a cycle.

The exact determination of the effect of counterbalance on the power throughout the cycle cannot be exactly predicted because of the large number of variables involved. For an electric-motor-driven well the power used at any time during the cycle can be obtained by using a recording wattmeter. In the case of a gas-engine-driven well, there is no simple experimental method available for measuring the instantaneous power output of the drive-shaft. It is necessary to develop, therefore, insofar as possible, some analytical method for determining the relative effects of beam and rotary counterbalances.

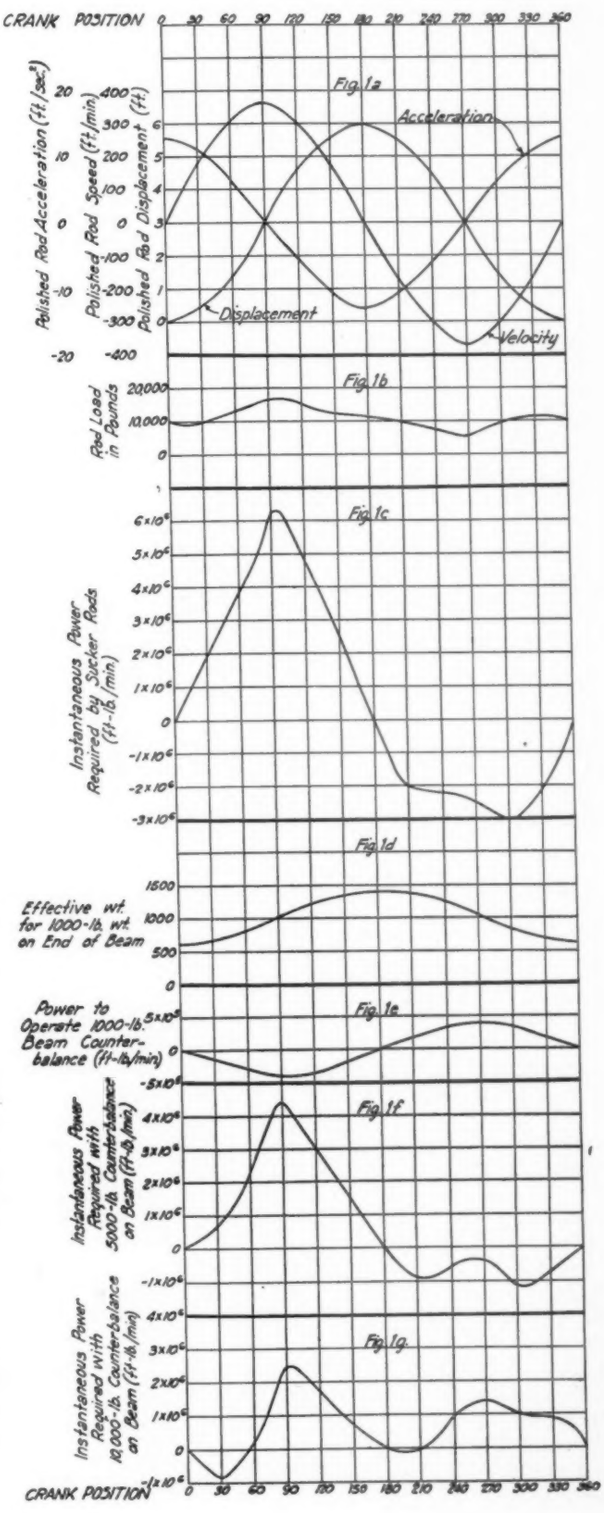
Some of the questions that will be discussed in this and in a later article are the relative merits of beam and rotary counterbalances, the effect of counterbalance on rod loads, the effect of counterbalance on shaking forces in pile foundations, and the use of dynamometer cards for determining the proper amount of counterbalance.

Beam Counterbalance

The work done on any body is equal to the force applied to the body times the distance the force moves in the direction in which the force is applied. The power required is the work per unit of time and is then the component of the force in the direction of motion times the instantaneous velocity.

In order to illustrate the method by which the power absorbed or delivered by a counterbalance can be obtained, the load and displacement diagrams shown in Figs. 1a and 1b were arbitrarily assumed. These curves are plotted against crank position. The polished rod motion has been taken as being simple harmonic and the velocity and acceleration curves were calculated on the basis of having a 6-ft. stroke at 20 r.p.m., or 125 radians per minute. The maximum velocity would be given by $r\omega = 377$ ft. per minute and the maximum acceleration would be $r\omega^2 = 13.2$ ft./sec.^{2}.

In determining the effect of the beam counterbalance the beam weight W was assumed to be acting at the end of the beam (see Fig. 2). If it had been taken at any other point, its velocity and acceleration would be directly proportional to its distance from the Sampson post bearing. The velocity and acceleration of this weight has been taken as being the same as that of the polished rod. While this is not theoretically correct the error introduced is very small. In any



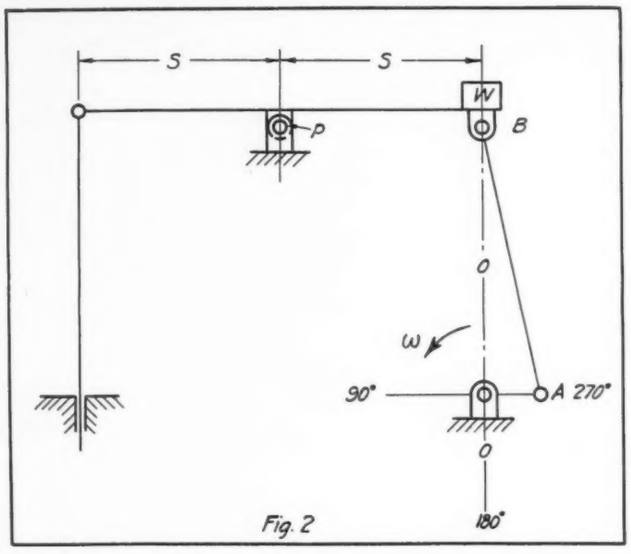


Fig. 2

case the vertical components of the velocity and acceleration will be the same as those of the polished rod.

In making the power calculations, it is necessary to take into account the acceleration of the beam weight W in order to determine its effective force or weight. This effective weight will be given by $W_e = W + \frac{W}{g}a$, where a is the acceleration of the weight in a vertical direction and $g = 32.2$. Fig. 1d shows the effective weight of 1000 lb. of counterweight at the end of the weight. It also shows that a 1000-lb. beam counterbalance is in effect equivalent to a 600-lb. weight at the bottom of the stroke and 1400 lb. at the top of the stroke.

The power required to operate the beam counterbalance is calculated from the fact that the instantaneous power is the product of the instantaneous beam weight and the velocity at that time. Fig. 1e shows the power required to operate 1000 lb. of beam counterbalance at any part of the cycle. For 5000 lb. of counterbalance, for instance, it is only necessary to multiply the power required by 1000 lb. of counterbalance by five. The curve has the same shape but a different amplitude. The angles are measured as in Fig. 2. The effect of taking into account the force to accelerate the weight is to cause the counterbalance to give up less of its energy at the start of the upstroke and to cause it to absorb more of its energy near the start of the downstroke. Fig. 1c shows the power to operate the sucker rods at any point in the stroke, the rod load being given in Fig. 1b. This curve shows that on the upstroke a very high peak is reached and that on the downstroke the power required becomes negative. The load is always in the same direction but the velocity reverses itself on the downstroke, causing the power to become negative. Actually the positive power represents power put into the system by the prime mover and the negative power represents work done on the system by the sucker rods on the downstroke due to their weight.

Fig. 1f shows the instantaneous power required of the prime mover if 5000 lb. of beam weights are used. This curve shows the peak reduced considerably but the rods are still driving the engine on the downstroke. The curve was obtained by multiplying the power to operate 1000 lb. of counterbalance by five and adding this algebraically to the power required by the sucker rods. Fig. 1g shows the power requirements with 10,000 lb. of beam weights. In this case the peak is only about 40 percent of the peak without beam counterbalance and the rods are no longer driving the prime mover on the downstroke.

In this elementary analysis the power required to overcome friction and the inertia effect of rotating parts have been neglected. The effect of friction will be to put a more or less constant power requirement on the unit. This corresponds to lowering of the zero line. The counterbalance will have the same effect but the percentage change that it will cause will be less. The inertia or flywheel effect of rotating parts will be considered in the next section.

Rotary Counterbalance

The instantaneous power to operate the rotary counterbalance is given by $P = T\omega$ if the crank turns at constant speed. Where T is the torque in ft-lb., ω is the angular speed in radians per minute ($\omega = 2\pi N$ where N is r.p.m.), and P is instantaneous power in ft-lb./min.

$$T = W R \sin \theta \quad \text{(see Fig. 3)}$$
$$P = W R \omega \sin \theta$$

If the speed of the wheel is constant all terms on the right hand side of the equation are constant except sin θ. This type of counterbalance then gives a power curve that varies as a sine wave if the speed is constant.

If the speed of the crank is not constant a torque must be supplied to give the rotary weight an angular acceleration. In this case $T = W R \sin \theta + I\alpha$. Where I is the moment of inertia of the weight and α is its angular acceleration. When α is positive, torque is being absorbed by the system; that is, the motor is speeding the system up and storing up kinetic energy. When α is negative the system is being slowed up and the system is giving up energy to the rods.

The analysis of the rotary counterbalance is made in the same manner as for the beam counterbalance. The load, displacement, velocity and acceleration curves have been taken the same as for the beam counterbalance as can be seen by comparing Figs. 1 and 4. Figs. 4a, 4b, and 4c were calculated exactly as for the beam counterbalance. Fig. 4d for the power consumed was calculated by the formula $P = WR\omega \sin \theta$ for 1000-lb. rotary weight with its center of gravity 4 ft. from the center of rotation.

The power curve for 5000 lb. of rotary weight was constructed by adding five times the power to operate 1000 lb. of rotary counterbalance to the power to operate the rods. This gives the value found in Fig. 4e. This curve shows a reduction in the peak and practically a complete reduction of the power on the downstroke. This is not enough counter-

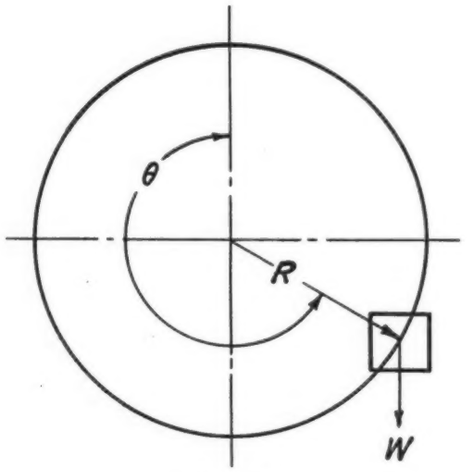


Fig. 3

balance since the peak is still too high and the rods still drive the motor a slight amount on the downstroke. The power curve for 10,000 lb. of rotary counterbalance is shown in Fig. 4f. In this case the well is over-counterbalanced. More power is being required on the downstroke than on the upstroke. A counterweight of about 8500 lb. would probably produce the best results for this particular set-up. Fig. 4g has been constructed for 5000 lb. of beam counterbalance and 5000 lb. of rotary counterbalance. This shows a very good arrangement. The peaks are practically equal and the maximum power required is less than one-third of the peak load with no counterbalance.

In case the rotary counterbalance has a lag or lead it is only necessary to shift the power curve for the rotary counterbalance ahead or back and proceed as in the case of when they are in phase.

The flywheel or inertia effect of the rotary counterbalance is the effect obtained when the weights are speeded up or slowed down. A flywheel is used on an ordinary engine to keep down the speed fluctuations, and it acts essentially as a special type of rotary counterbalance or rotary load balancer. It only operates when it is being speeded up or slowed down, in which case a torque, $T = I\alpha$ is required to speed it up or slow it down, as the case may be. Since I is approximately equal to $\frac{W}{g}R^2$, where W is the weight of the counterbalance, $g = 32.2$ and R is the distance to the center of gravity of the weights. The value of α need not be very large to require a considerable torque. To determine the value of α it is necessary to know the instantaneous speeds of the counterbalance shaft.

The inertia or flywheel effect of the countershaft pulleys, clutches, motor, rotor, etc., also enter into the problem in the same manner as the flywheel effect of the counterbalance. The effect of the different parts will depend to some extent upon the type of drive; for instance, a belt drive would tend to damp out sudden changes whereas a gear drive would not have much flexibility and would transmit the motion directly. The determination of these effects would require accurate instantaneous measurement of the different shaft speeds.

In the case of either type counterbalance, it should be noted that they do not give up or absorb power at the end of the strokes. There also is no power required of the prime mover at these points to operate the sucker rods as their velocity is zero at the end of the stroke. Except for friction in the equipment and inertia of rotating parts there is no power required of the prime mover.

Since the flywheel or inertia effect of the rotary counterbalance is the main difference between the two types of counterbalance we will consider its effect in comparison with the effect of the engine flywheel. The flywheel effect is obtained by changing the speed of rotation of the member, and in so doing its kinetic energy is changed. This change is determined by:

$$\Delta KE = \tfrac{1}{2}\, I\, (\omega_1^2 - \omega_2^2)$$

Where ΔKE = Change in kinetic energy

I = moment of inertia of the element $= \frac{W}{g}k^2$

k = Radius of gyration of rotating parts

W = Weight of rotating parts

$g = 32.2$

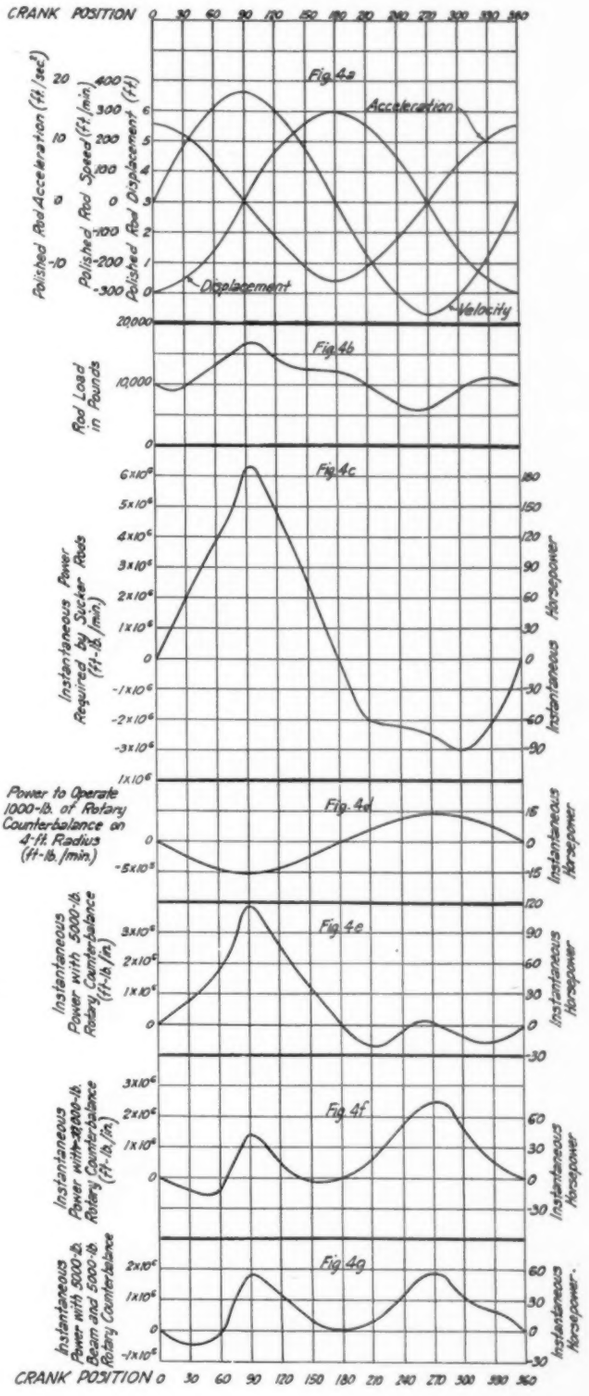
ω_1 = Angular velocity at start

ω_2 = Angular velocity at end of period considered

If we assume that ω_2 is a certain percentage higher or lower than ω_1, we have $\Delta KE = \tfrac{1}{2}\, C\omega_1^2$ where $C = 1 -$ ratio of ω_2 to ω_2, or $C =$ coefficient of speed fluctuation. The value of C will be greater for the engine flywheel than for the rotary counterweight. Assuming for simplicity that k and the weight W are the same for the flywheel and rotary weight we would then have that the change in KE would be proportional to the relative speeds squared. If the speed reduction between the engine and the countershaft be 10 to 1 the ratio of their kinetic energies would be 100 to 1; in other words, the flywheel would be 100 times more effective than the rotary weight. It appears, therefore, that for ordinary conditions the flywheel effect of the rotary weight is negligible, even if its actual weight is several times greater than the weight of the flywheel and the effect of other rotating parts be neglected.

Comparison of Beam and Rotary Counterbalances

In order to make a direct comparison between the two types of counterbalance it is necessary to compare an appli-



cation of the two to the same well. In this case the friction and inertia of the rotating parts of the two systems will be identical except for the inertia of the rotary counterweight.

The motion of the weight of the rotary counterbalance in a vertical direction is simple harmonic except as affected by speed fluctuations. The motion of the beam counterbalance also would be simple harmonic except that it is affected by the angularity of the pitman. For short strokes then, they have practically the same type of motion if the speed is constant. For longer strokes, there is an appreciable deviation but not enough to bring about any radical variation in counterbalancing effect.

In the case of large speed fluctuations the rotary weight would be more effective provided the maximum rate of change of angular speed took place near the middle of the upstrokes and downstrokes where the power of the counterbalance is most needed. The beam counterbalance having its maximum velocity at that point has a small acceleration and consequently has an effective weight approximately equal to the static weight.

The effectiveness of either type of weight depends upon its distance from the center of rotation and also both depend upon the angular speed. The beam counterbalance is limited in its distance from the center of rotation by the beam length and its acceleration on the upstroke cannot exceed 32 ft./sec.^{2} without causing the weight to leave the beam, unless it is rigidly fastened. If the acceleration exceeds 32 ft./sec.^{2} at the end of the downstroke of the pump, the effective weight becomes negative.

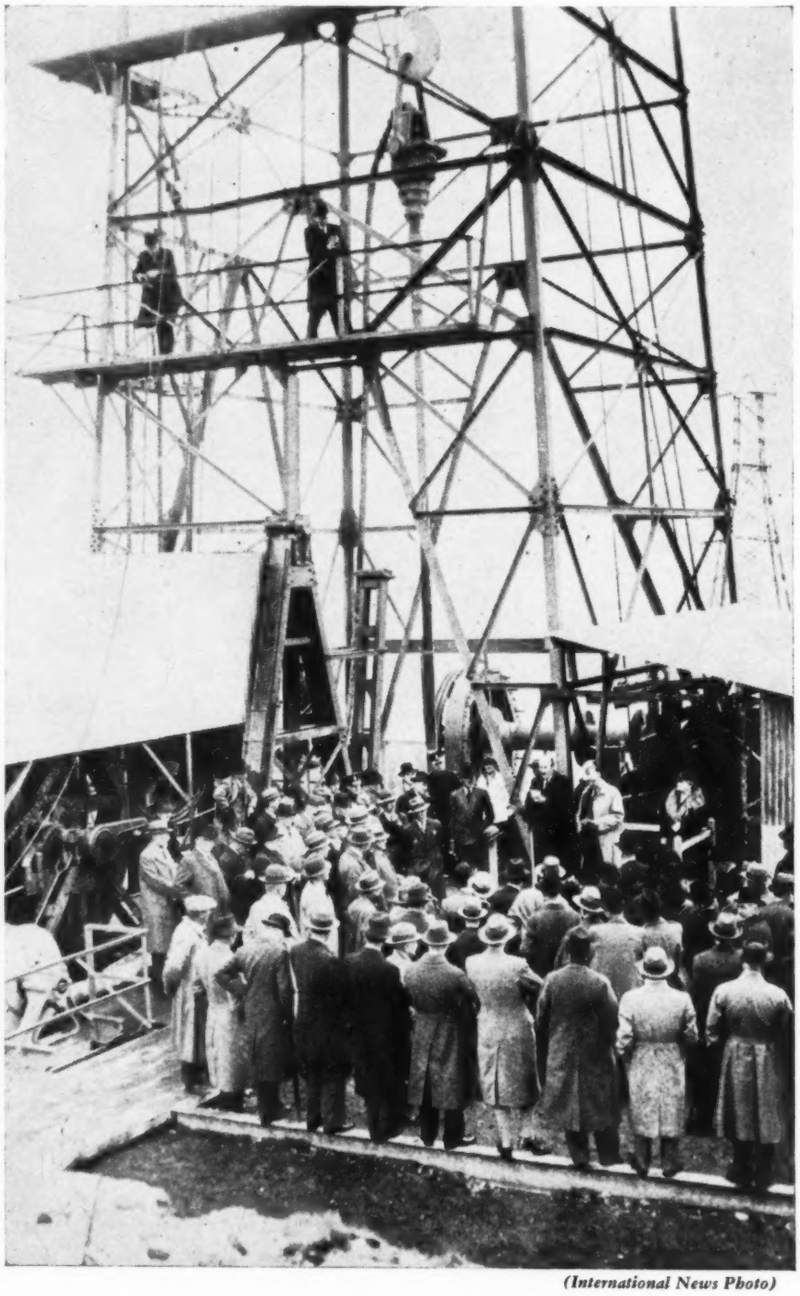
As far as counterbalancing effect is concerned, the only theoretical advantage possessed by the rotary weight is its inertia effect, which depends upon the amount of speed variation but which is seen to be small compared with the effect of the engine flywheel. No more definite conclusion than this can be made without having data on the actual speed fluctuations, operating characteristics of the system, and proportions of other parts. There are several other factors that should be considered in the selection of counterbalance such as shaking forces in the supporting members; these will be considered in a later article.

Quest for Oil Begins in Hampshire, England

HERE is shown a group of notables in the British oil industry at the spudding-in of a test well for oil in the south of England. This is the first well to drill for oil under the prospecting licenses granted by the Board of Trade under The Petroleum Act of 1934. It is being drilled near an old chalk quarry at Paulsgrove, Portsmouth, England, by the D'Arcy Exploration Company, a subsidiary of the Anglo-Iranian Oil Company.

Oil was discovered some 15 years ago at Hardstoft, England, but in very small commercial quantities.

The equipment consists of a 136-ft. steel derrick and the most modern type of heavy rotary drilling machinery capable of drilling to a depth of at least 10,000 feet. The mother of Captain H. F. C. Crookshank, the Secretary for Mines, set the drilling machinery in motion. In the picture Sir John Cadman, chairman of the Anglo-Iranian Oil Company, is seen making a speech before the drilling began in which he said in part: "The enterprise upon which we are now embarking is, first and foremost, a business venture, based on scientific observation, and organized with all the elaboration of detail that engineering skill and experience can suggest."



(International News Photo)

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G-B MFG. CO.

This photograph of a tractor mired down gives some indication of the difficulties encountered in swamp areas.

By

LAURENCE H. FAVROT

President, Apex Construction Company, Houston, Texas

Double Pipe Line Laid T

THE laying of two pipe lines in the same ditch, one for the transportation of crude oil and the other for gas, a considerable portion of which was through swampy areas, has been successfully completed for the Continental Oil Company although accompanied by many construction difficulties. The two lines, each approximately 45 miles in length, totaling 90 miles, were laid from the Tepetate oil field of Coastal Louisiana to a point on the west side of the Calcasieu River near Lake Charles. The oil line is 6⅝-in. pipe and the gas line of 8⅝-in., all of which is standard weight, double random length, steel stock.

Construction of the oil line provides an outlet for crude from the new Tepetate field, eliminating a long barge haul that otherwise would be required. At Lake Charles a loading terminal has been erected, consisting of a 500-ft. dock, loading apparatus, two 80,000-bbl. and one 10,000-bbl. storage tanks.

The gas output of the field will be utilized for commercial purposes. The Continental Oil Company is erecting a casinghead gasoline plant in the field and the gas will be stripped of its gasoline content and the residue boosted to Lake Charles.

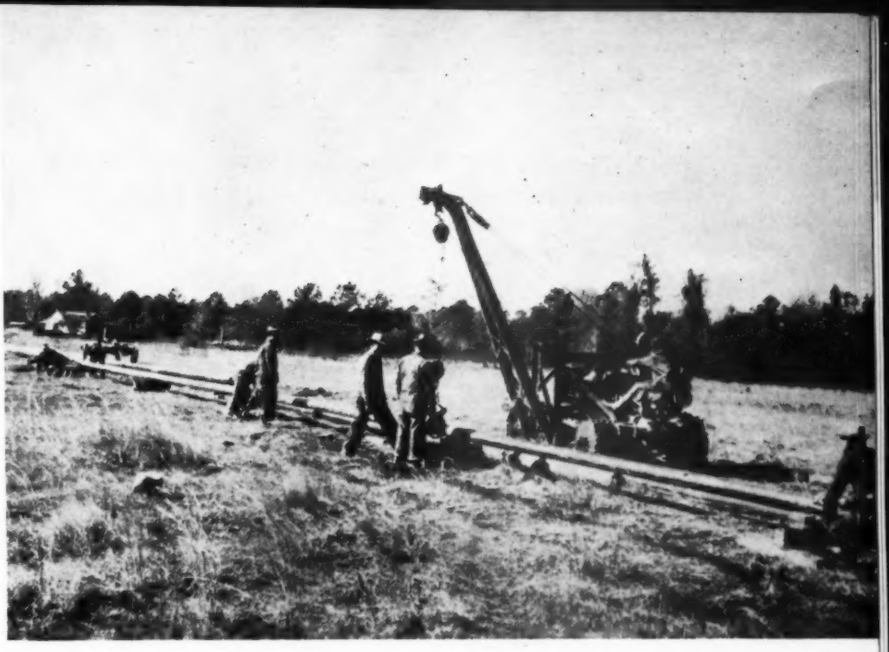
The sequence of operations in the construction of the pipe line consisted of clearing all timber and underbrush from the right-of-way to a width of 35 ft., building temporary gates in fences crossing the right-of-way, and temporary portable bridges across ditches, small creeks, etc. The pipe was then unloaded from railroad cars and strung. The two lines were lined up side by side and welded simultaneously into 240-ft. sections, all roll welds being made by the electric process. There were two welding gangs, one starting at Tepetate, the other at Lake Charles. The pipe used had ends bevelled at a 30-deg. angle. Welded joints were of the plain end type without backing-up ring. Three beads were used for each weld, the first being made with $\frac{3}{16}$-in., the second with ¼-in., and the third with $\frac{5}{16}$-in. electrodes. One tacker and three welders averaged 4.2 joints per hour.

The sections were tied in by means of bell-hole welds, these being made entirely by the oxy-acetylene Lindeweld process, Fleetweld coated rods being employed.

A trench approximately 32 in. in width and a minimum of 30 in. in depth was dug, and after the two lines were tied in they were both lowered, wooden blocks placed at intervals to keep them apart, and the ditch backfilled.

Portions of the line, as designated by the owner, were coated as protection against corrosion. All pipe laid

Welding pipe into sections before laying it in swamp on the west side of the Calcasieu River.



Lining up pipe for the welders.

Construction methods used and difficulties met in laying two pipe lines, one for gas the other for oil, each 45 miles long and laid in same ditch, much of which traversed swamp.

Through Louisiana Swamp

through swamps was so treated. In making railroad and highway crossings the lines were placed inside steel casing, each line in a separate casing. In crossing the Calcasieu River and the English Bayou, the lines were encased also, the 6⅝-in. pipe being placed inside 8⅝-in. casing and the 8⅝-in. pipe inside 10¾-in. casing. The ends of the casing were sealed in the water crossings and grease pumped between the inside wall of the casing and the outside wall of the encased pipe. River clamps were attached to the outside of the casing to weight down the pipe in the river. These crossings necessitated considerable work and engineering skill. Small tugs and barges were required in making the river crossing, and also were used for transporting the contractor's equipment across the Calcasieu River, the English Bayou, and Bayou Nezpique.

Many types of ground were encountered along the right-of-way, eight miles being timber land, two and one-half miles swamp land, ten miles pasture land, 16 miles of cultivated rice fields, and eight miles of land to be laid out as rice fields in 1936. Through rice fields small levees are built for the purpose of holding water, and these had to be cut when the pipe line was laid, later to be rebuilt. Inasmuch as the line was constructed early in the year no growing rice was encountered. Had it been laid somewhat later additional difficulties would have been encountered, because farmers start planting rice in March; the fields being flooded in May and from then until the latter part of August the fields are submerged.

During the latter part of January and the first three weeks of February the weather was extremely bad, rainfall heavy, and considerable difficulty was experienced in carrying on construction operations, particularly in the transportation of equipment. From then until the job was completed, however, conditions were favorable and rapid progress was possible.

Two main line gangs and one river crossing and swamp gang were placed on the job at the outset of construction activities, one commencing operations in the Tepetate oil field, the other at the terminal site at Lake Charles. Working toward each other, the east gang laid approximately 55 percent of the line and the west gang approximately 45 percent.

The line was subjected to two tests, one an air test, the other a hydrostatic test.

The general contractor for the line was the Apex Construction Company, Houston, Texas. H. C. Price, Inc., Bartlesville, Oklahoma, had the sub-contract for electric welding, and the contract for stringing was let to the Union City Transfer, Beaumont, Texas.

Those in charge of the work for the Apex Construction Company were G. A. Peterkin, vice-president, and D. A. Swink, superintendent; for the Continental Oil Company A. C. Wilkinson, Ponca City, Oklahoma, superintendent of pipe lines, and Mr. Huffman, resident engineer.

Making a firing line weld.

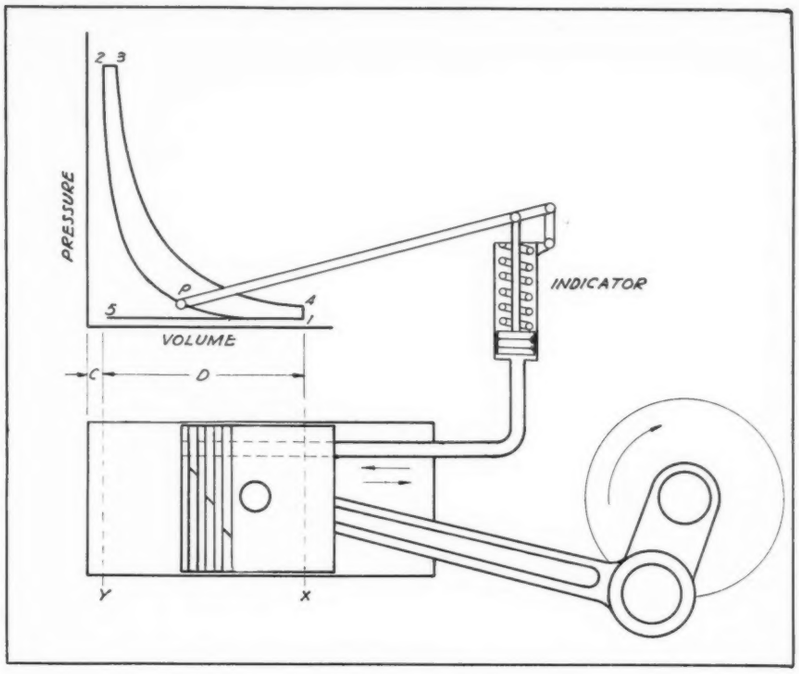


Fig. 8. The theoretical Diesel cycle pressure-volume indicator card and a diagram illustrating the idea of construction

By
JOSEPH
LISTON

Part 3

Fundamentals of the Internal Combustion Engine

CYCLES FOR THE DIESEL ENGINE

In the two preceding articles[1] the principles of operation, the possibilities, and limits of the basic cycle for gas and gasoline engines were discussed. Chief among the conclusions drawn were the facts that increasing the compression ratio results in increased power and efficiency, but improvement is limited in this direction by the phenomena of detonation that occurs at the higher compression ratios.

It is common knowledge that the Diesel uses compression ratios between two and three times as high as the gas and gasoline engine, and, in view of the limits set on the latter types, it becomes of interest to know how such high ratios are possible in the Diesel. A brief description of the theoretical Diesel cycle will aid in answering this question.

Fig. 8 shows a theoretical Diesel cycle card for a compression ratio of 15 and an exponent of compression and expansion of 1.3. The action during the cycle is as follows:

Assume the piston is at position x (crank end or bottom dead center). As it moves toward y, the volume to the left of the piston decreases and the pressure rises along the line 1-2. In the Diesel the clearance volume C is quite small in proportion to the displacement D, hence the compression pressure at point 2 is much higher than in the Otto cycle. The theoretical variation of temperature during compression is expressed by the relation:

$$T_2 = T_1 \times CR^{n-1}$$

where T_2 is the compression temperature, deg. fahr. abs.

T_1 is the initial temperature, deg. fahr. abs.

The compression temperature for a ratio of 15 is about 780 deg. fahr., Fig. 5.

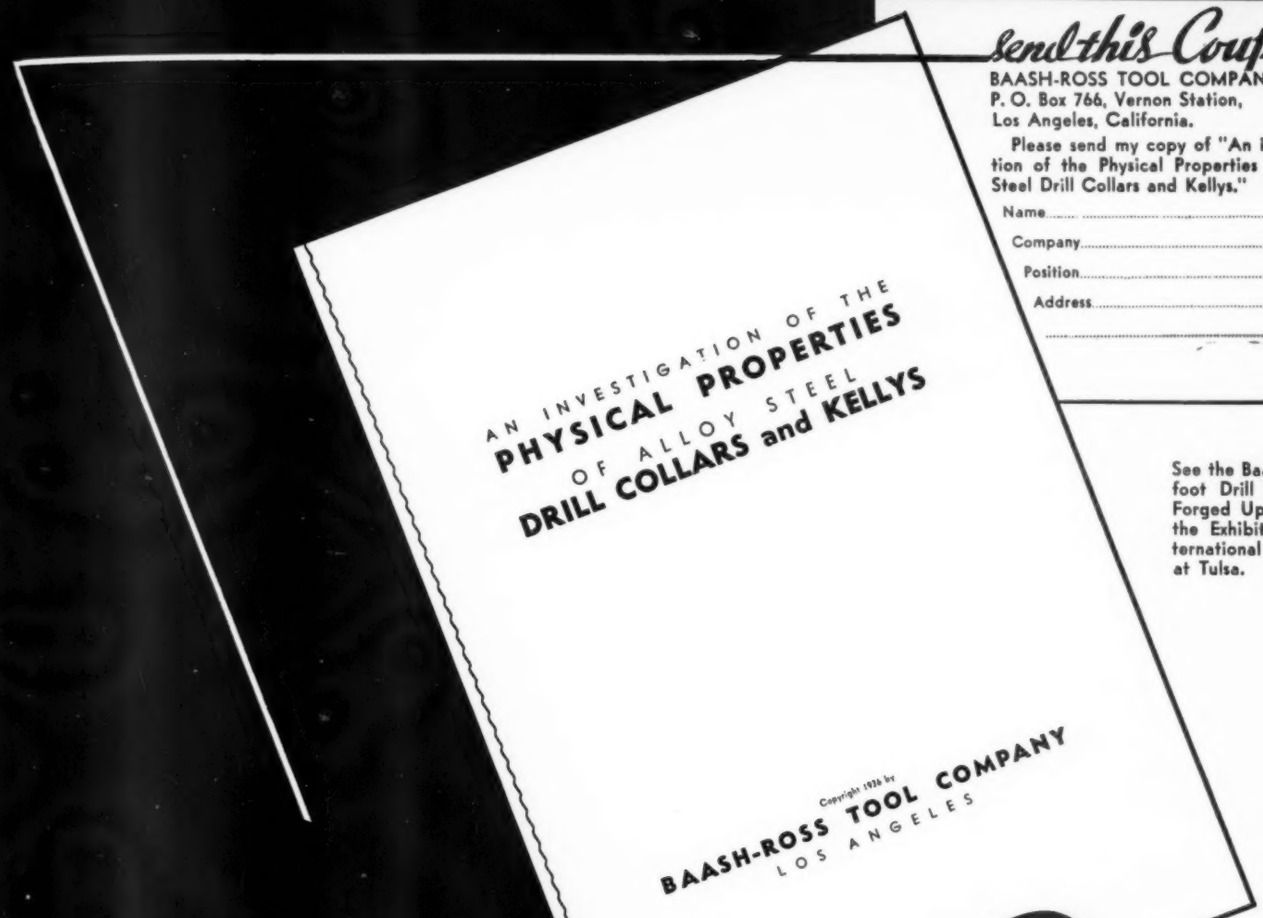
In actual engines having compression of 15, the compression temperature may vary considerably from this value. Absorption of heat from the residual or clearance gases and from the hot cylinder walls will tend to raise the temperature at the end of compression. Flow of heat from the charge to the cooling medium during the last part of the compression stroke will tend to reduce the compression temperature. The net result of so many variables is difficult to determine accurately, but the fact that fuel will ignite when it comes in contact with the compressed air is evidence that the compression temperature is at least as high as the spontaneous ignition temperature of the fuel.

In contrast to the gas and gasoline engines that mix the fuel and air before compression, the Diesel compresses the air first and then at or near the end of the compression stroke the fuel is forced into the cylinder either by a blast of air at a pressure higher than the compression pressure or by hydraulic pressure on the liquid fuel. In either case the fuel is finely atomized, and when it comes in contact with the high-temperature air, it ignites spontaneously.

In the theoretical cycle, Fig. 8, the fuel is considered to enter the combustion chamber gradually during the first part of the return stroke of the piston. The rate of entry is such that the pressure remains constant during combustion 2-3. Then as the piston continues to move toward x, expansion takes place, 3-4. From 4 to 1, heat is considered to escape to the exhaust and then the cycle is repeated.

At the usual compression ratios, the maximum pressure in the theoretical Diesel cycle is considerably higher than in the Otto cycle, and this necessitates a stronger and heavier con-

[1] "Fundamentals of the Internal Combustion Engine," (Part 1), by Joseph Liston—*The Petroleum Engineer*, December, 1935.
"Fundamentals of the Internal Combustion Engine," (Part 2), by Joseph Liston—*The Petroleum Engineer*, January, 1936.



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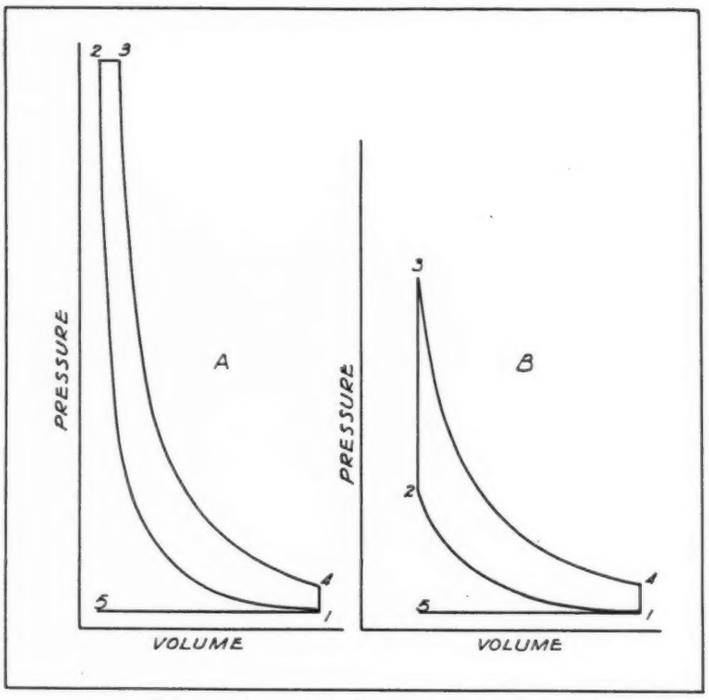

Fig. 9. Comparison of (A) a theoretical Diesel cycle card at a compression ratio of 15 and (B) a theoretical Otto cycle card at a compression ratio of 5

struction. The relative proportions of the two cycles when constructed to the same pressure scale are shown in Fig. 9.

As in the case of the Otto cycle the most useful purpose of the theoretical Diesel cycle is to set up standards of comparison or attainment for judging actual results. The useful work or power that can be developed is found in much the same way as for the Otto cycle.

The work done in compressing the charge is:

$$W_c = \frac{P_1 V_1 - P_2 V_2}{n - 1} \times \frac{1}{12}$$

where W_c is in ft-lb.

P_1 and P_2 are in lb./sq. in. abs.

V_1 and V_2 are in cu. in.

n has usually a value between 1.25 and 1.35

$\frac{1}{12}$ is the factor for converting in-lb. to ft-lb.

The work done by the expanding gas is:

$$W_{ex} = P_2 (V_3 - V_2)\frac{1}{12} + \frac{P_3 V_3 - P_4 V_4}{n - 1} \times \frac{1}{12}$$

where W_{ex} is in ft-lb.

P_2, P_3, and P_4 are in lb./sq. in. abs.

V_2, V_3, and V_4 are in cu. in.

The net or useful work is:

$$W_{net} = W_{ex} - W_c$$

Using the same size of cylinder as that for the Otto cycle, i.e., 5-in. bore and 6-in. stroke, the work of compression for a ratio of 15/1 and a value of n = 1.3 is found as follows:

The displacement is:

$$D = \frac{\pi}{4} \times 5^2 \times 6 = 117.9 \text{ cu. in.}$$

The clearance volume is found from:

$$\frac{C + 117.9}{C} = 15$$

Or:

$$C = 8.4 \text{ cu. in.} = V_2$$

And:

$$V_1 = C + D = 8.4 + 117.9 = 126.3 \text{ cu. in.}$$

The compression pressure is:

$$P_2 = P_1 \times CR^n = 14.7 \times 15^{1.3}$$

$$P_2 = 497 \text{ lb./sq. in. abs.} = P_3$$

The work of compression is:

$$W_c = \left(\frac{14.7 \times 126.3 - 497 \times 8.4}{1.3 - 1}\right) \times \frac{1}{12}$$

$$= -645 \text{ ft-lb.}$$

(The quantity is negative because the work is done by the engine on the gas.)

Assuming the pressure at the end of the expansion stroke is 40 lb./sq. in. abs. ($=P_4$), the volume at the end of the combustion period, i.e., the beginning of the expansion stroke, is:

$$V_3 = \left(\frac{P_4}{P_3}\right)^{\frac{1}{n}} \times V_4$$

but $P_3 = P_2$

and $V_4 = V_1$

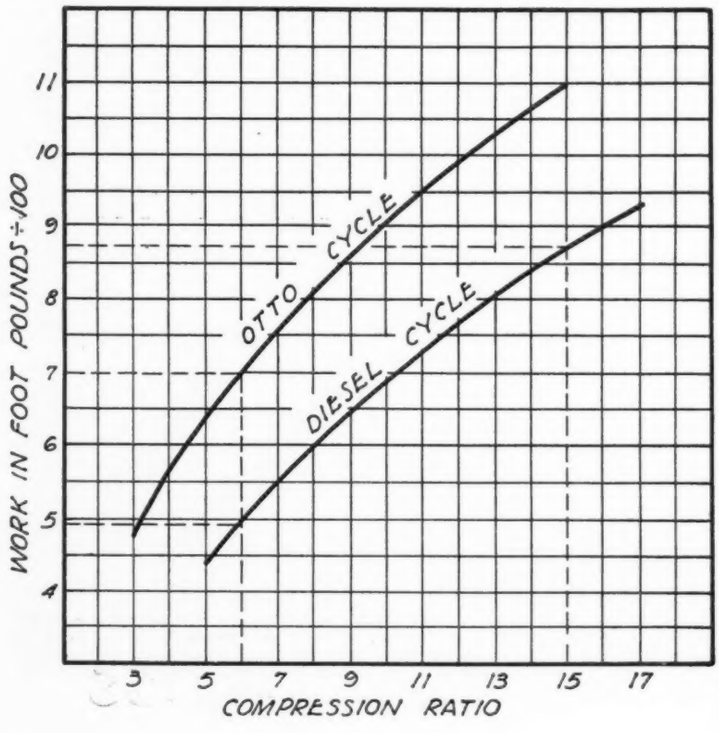

Fig. 10. Variation of useful work with compression ratio for the theoretical Otto and Diesel cycles

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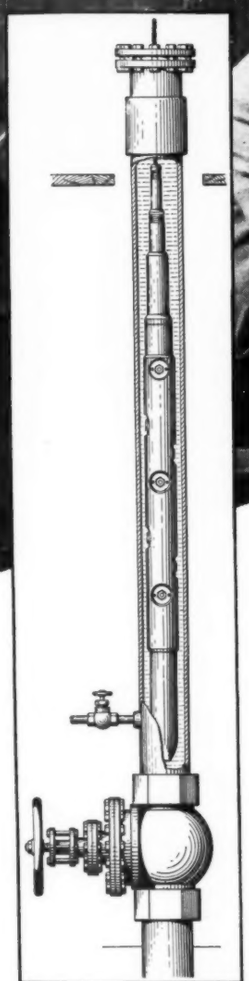

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substituting:

$$V_3 = \left(\frac{40}{497}\right)^{\frac{1}{1.3}} \times 126.3$$
$$= 18.12 \text{ cu. in.}$$

The work done during the combustion period is:

$${}_2W_3 = P_2\left(V_3 - V_2\right)\frac{1}{12} = \frac{497\ (18.12 - 8.4)}{12}$$
$$= 403 \text{ ft-lb.}$$

The work done during the expansion period is:

$${}_3W_4 = \left(\frac{P_3 V_3 - P_4 V_4}{n - 1}\right)\frac{1}{12}$$
$$= \left(\frac{497 \times 18.12 - 40 \times 126.3}{1.3 - 1}\right)\frac{1}{12}$$
$$= 1098 \text{ ft-lb.}$$

The total work done by the expanding gas is:

$$W_{ex} = {}_2W_3 + {}_3W_4$$
$$= 403 + 1098 = 1501 \text{ ft-lb.}$$

The net or useful work of the cycle is:

$$W_{net} = W_{ex} - W_c$$
$$= 1501 - 645 = 856 \text{ ft-lb.}$$

The variation of the net or useful work of the Diesel cycle with compression ratio for the above assumed conditions is shown in Fig. 10. The variation of net work for the Otto cycle is reproduced from Fig. 4 to facilitate comparison.

It will be observed, Fig. 10, that at any given compression ratio, for example, 6, more useful work can be obtained from the Otto cycle than from the Diesel cycle. As the same size cylinder was used in calculating the work for each of these cycles, the same quantity of heat energy was theoretically supplied in each case. Hence, it would be expected that, for any given compression ratio, the Otto cycle would be more efficient than the Diesel cycle.

In practice, however, engines operating on the Otto cycle are limited to a useful range of compression ratio of about 5 to 7.5, whereas engines operating on the Diesel cycle usually have compression ratios in the range between 10 and 16. Detonation in Otto cycle type engines acts as an upper limit for the compression ratio. The minimum compression temperature at which the injected fuel will ignite places a lower limit on the compression ratio in the Diesel.

Comparing the Otto cycle at a compression ratio of 6 with the Diesel cycle at a compression ratio of 15, it is seen, Fig. 10, that more useful work can be obtained from the Diesel.

While the above conclusions on the relative useful work possible in the theoretical Otto and Diesel cycles apply in general to the actual engines, one important factor acts to minimize the advantage of the Diesel, i.e., it requires more excess air for complete combustion, and this reduces the specific power output of the Diesel as compared to the Otto cycle engine; however, this is not serious except where high power and small size are essential.

The efficiency of the theoretical Diesel cycle may be expressed by the relation:

$$E_D = 1 - \frac{1}{CR^n - 1}\left[\frac{\left(\frac{V_3}{V_2}\right)^n - 1}{n\left(\frac{V_3}{V_2} - 1\right)}\right]$$

where E_D is the efficiency

CR is the compression ratio

V_3 is the volume above the piston at the end of the combustion period

V_2 is the clearance volume.

Using the same size of cylinder that was used in calculating the work of the Diesel cycle, for a compression ratio of 15, a value of n of 1.3, $V_3 = 18.12$ cu. in., and $V_2 = 8.4$ cu. in., the efficiency is:

$$E_D = 1 - \frac{1}{15^{1.3-1}}\left[\frac{\left(\frac{18.12}{8.4}\right)^{1.3} - 1}{1.3\left(\frac{18.12}{8.4} - 1\right)}\right]$$

$E_D = .495$ or 49.5 percent

Comparing this value with the efficiency for the Otto cycle at a compression ratio of 15, it is seen that, for the same compression ratio, the Otto cycle is more efficient than the Diesel cycle. The variation in theoretical Diesel cycle efficiency with

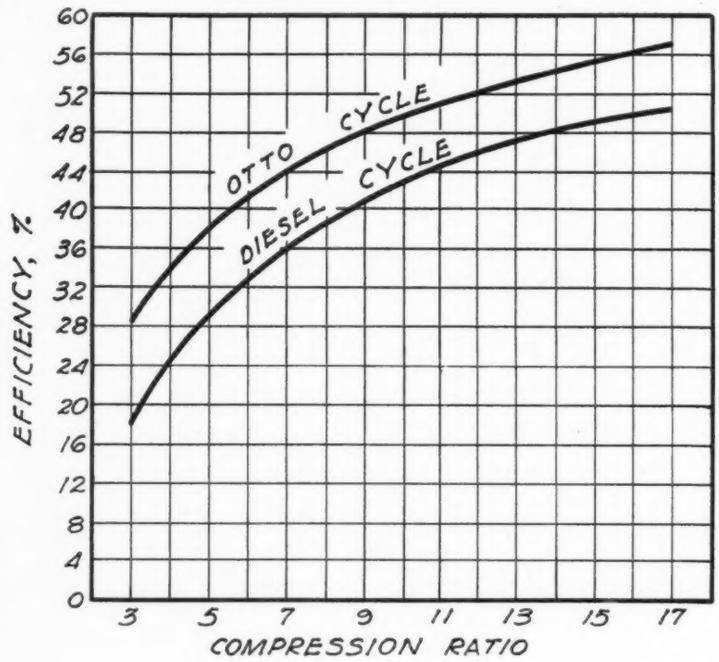

Fig. 11. Effect of compression ratio on the theoretical efficiency of the Otto and Diesel cycles

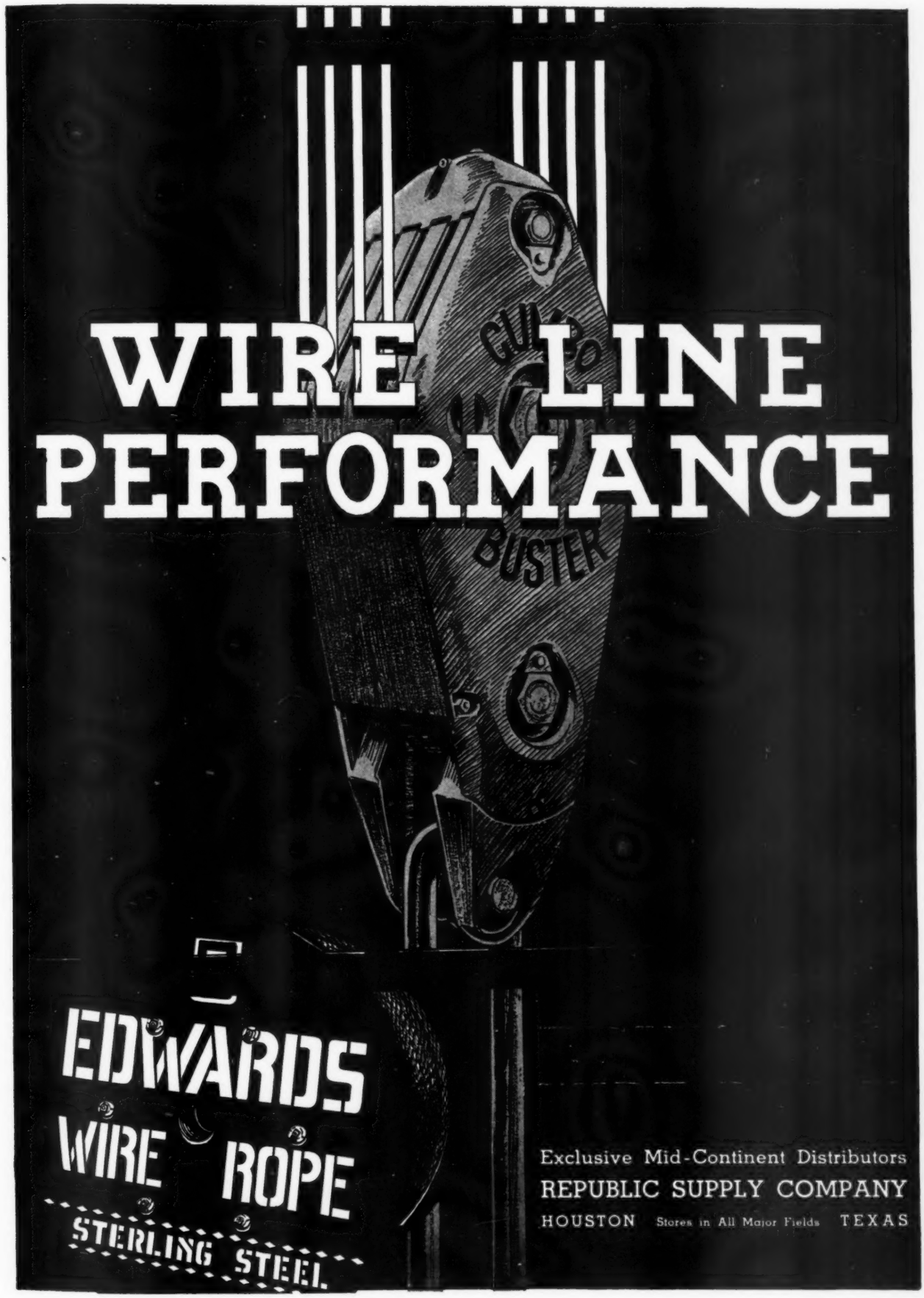
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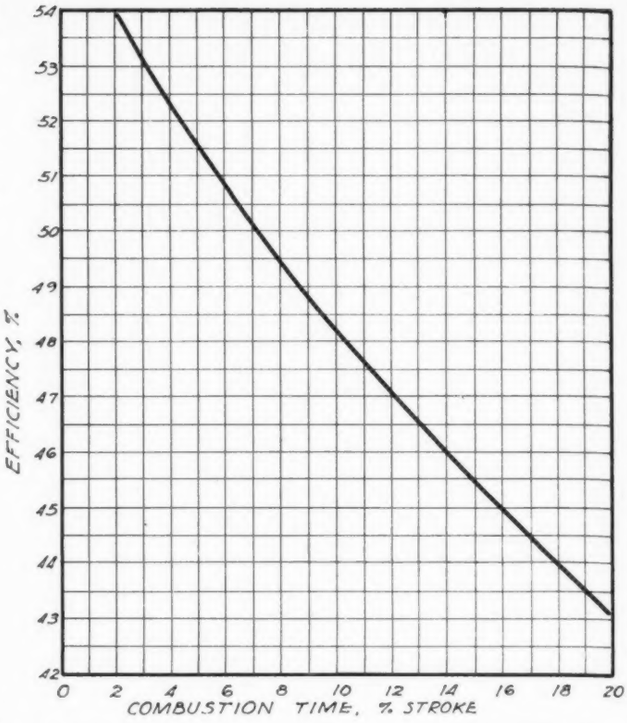
Fig. 12. Effect of combustion time on the efficiency of the theoretical Diesel cycle



compression ratio for constant values of n and V_3/V_2 is shown in Fig. 11.

The ratio V_3/V_2 is sometimes expressed as a percentage of the expansion stroke. The percentage of the piston displacement occurring during combustion is:

$$\text{Percent expansion stroke} = \frac{V_3 - V_2}{V_1 - V_2} \times 100$$

and the terms of the ratio V_3/V_2:

$$\text{Percent expansion stroke} = \frac{\frac{V_3}{V_2} - 1}{\frac{D}{V_2}} \times 100$$

For the example under consideration:

$$\text{Percent expansion stroke} = \frac{\frac{18.12}{8.4} - 1}{\frac{117.9}{8.4}} \times 100$$

$$= 8.28 \text{ percent}$$

In the case of the theoretical Otto cycle, the efficiency is affected by the compression ratio and the value of n. The theoretical Diesel cycle efficiency is controlled by the compression ratio, the value of n, and, in addition, the ratio V_3/V_2. Hence, from the above relation, the efficiency of the Diesel is affected by the proportion of the power stroke occupied by the combustion period. This relation is shown in Fig. 12.

Method of Replacing Center Ring Without Removing Pipe From Ground

By LUTHER TOLBERT, Assistant Pipe Line Superintendent,
Lone Star Gas Company

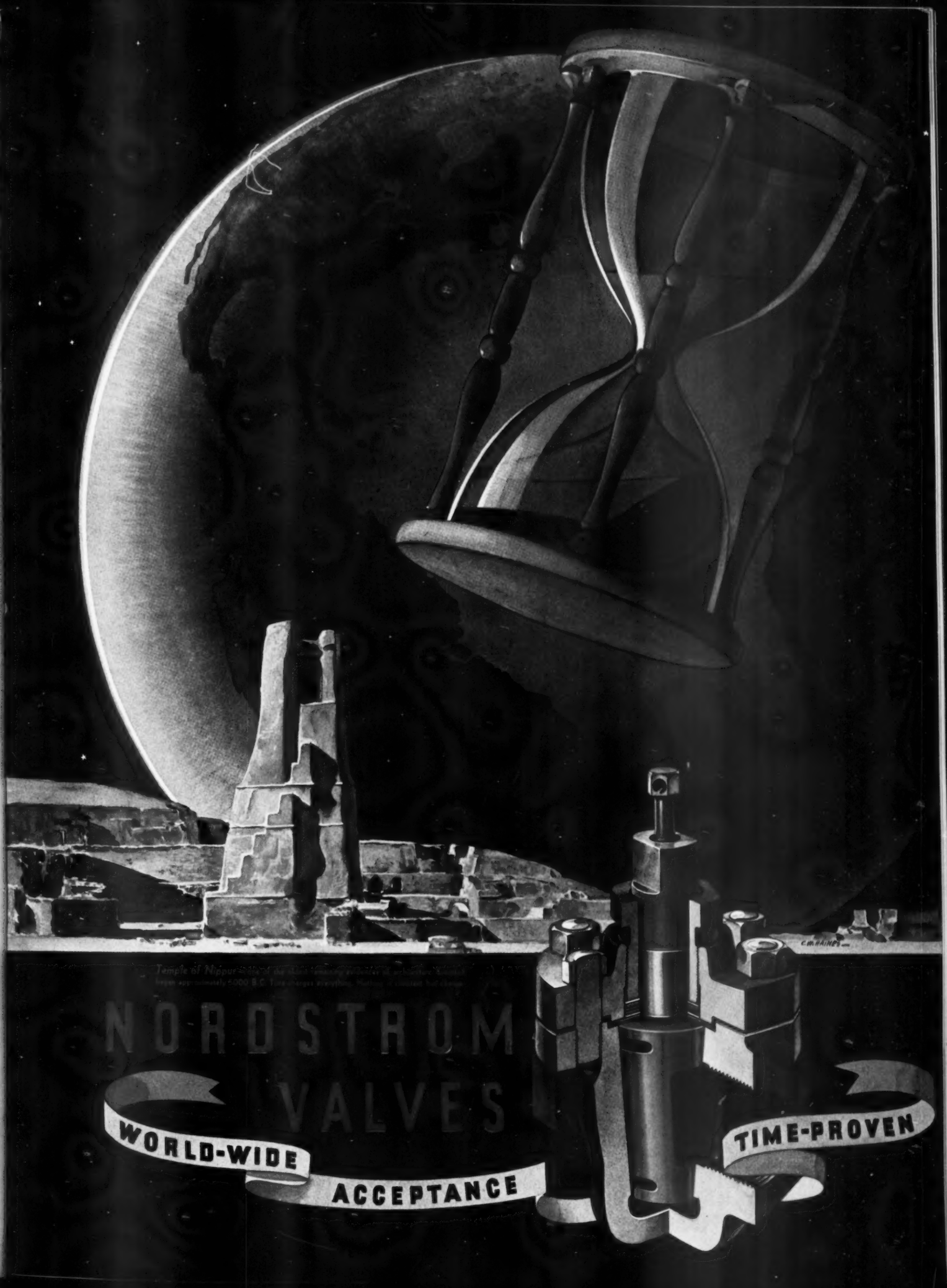
A METHOD, devised by the writer, for removing a center ring from a gas-line coupling without taking the full joint of pipe from the ground is being used successfully by the Lone Star Gas Company, effecting a considerable economy in time and money, since it is necessary to dig but one bell-hole of the usual size and only the damaged center ring is lost. The procedure is as follows:

The bell-hole is dug, the coupling unbolted, and the followers knocked back out of the way. One longitudinal cut is made across the slip ring with a torch and heated on the side opposite the cut to a cherry red so that it may be spread to go around the pipe and the ends brought together again without kinking. The cut or bend should not be made near the factory or original weld. The ends are then welded together, making a complete ring. Care must be exercised in welding to protect the lip of the ring from being fouled by hot metal. This can be accomplished by placing a small wedge, the same slope as the lip of the center ring, between the pipe and the lip of the ring. The new ring now being ready to slip into place, the old ring may be cut off. The torch may be used safely to cut about half the thickness, since the old rubbers are still in place. The torch had best be extinguished then and the cutting off of the old center ring completed with a diamond-point. Take off old rubbers and clean pipe thoroughly, slip new ring into place, put new rubbers on by cutting diagonally and tacking ends back together, knock followers into place, and bolt up.

The cost of the old method and the one just described are given herewith for a 16-in. line. Prices of materials, it should be remembered, are approximate, as they may change subsequent to the writing of this article.

Labor, old method: Digging two bell holes, stripping joint, cutting bead out of the two center rings, installing new center rings, backfilling—total cost, $25.00. Material: Two center rings, $2.88; two sets of rubbers, $2.40; two sets of bolts, $1.06—total, $6.34. Grand total, $31.34.

Labor, new method: Digging one bell hole, cutting bead out of one center ring, cutting, welding, and installing one center ring, backfilling—total, $4.80. Material: One center ring, $1.44; one set of bolts, 53 cents; one set of rubbers, $1.20; welding material, 75 cents—total, $3.92. Grand total, $8.72.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Socketing Wire Rope

By WALTER VOIGTLANDER[1]

FIELD OBSERVATIONS, SUBSTANTIATED BY LABORATORY TESTS, SHOW MAJOR WIRE ROPE TROUBLES RESULT FROM IMPROPER SOCKETING METHODS

NUMEROUS complaints from the field when investigated have proved conclusively that improper socketing is the cause of most of the major sources of trouble with steel drilling lines.

Figs. A, B, C, D, and E show but a few of the destructive methods of socketing mandrels. These photographs are made from rope ends actually picked up from various rigs in the Mid-Continent field. To take just one example: the method of socketing shown in Fig. B resulted in high-stranding the wire rope as shown in Fig. E. This high-stranding was observed for a distance of 2800 ft. from the tools up to the clamp after only two day's operation. The line above the clamp was not high-stranded and when cut to this point and properly socketed no further trouble developed.

In the face of such evidence the company with which the writer is connected was led to make a series of socketing tests to determine conclusively the value of proper socketing. Prepared samples all cut from the same stock reel of 1-in. 6 by 19 wire rope were made up according to the more prevalent methods of socketing observed in the field. To one end of each sample a standard closed wire rope socket was attached by the usual wire rope shop method of "mule-tailing" the wires, leaving the wires straight (ends *not* bent). The ends were cleaned with hydrochloric acid and poured with melted *zinc* (*not* babbit, lead, or any other low-melting metal or alloy). To the other end of each sample a mandrel was attached using in each case one of the more common methods found in actual use in the field. The results of these interesting tests are outlined in the series of accompanying photographs.

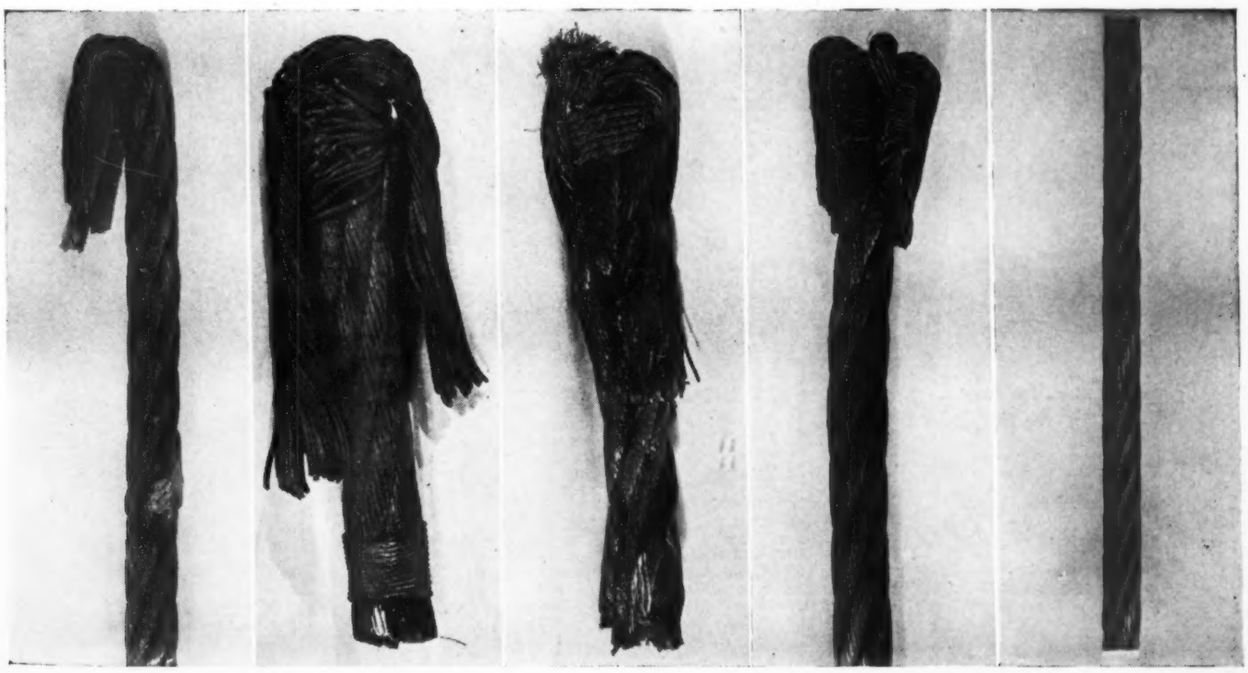
It will be clearly noted from the photographs of the samples tested that all socketing methods with the exception of that shown in Tests No. 7 and 8, that of "mule-tailing" the wires and keeping them straight, resulted in unequal movement *within the mandrel*. In *no* case was there any movement or failure within the standard socket. In each of the first six tests here illustrated, the failure was *within the mandrel*.

After trying practically all the metals and alloys commonly used for socketing, the only one found reliable in its holding power was *zinc*, commonly called spelter.

In actual field service wire rope rarely fails by breaking in the mandrel, instead, as shown in Figs. B and E, the uneven movement of the strands within the mandrel has caused high or drawn strands to develop.

[1]Chief Engineer, Union Wire Rope Corporation, Kansas City, Missouri.

Fig. A Fig. B Fig. C Fig. D Fig. E



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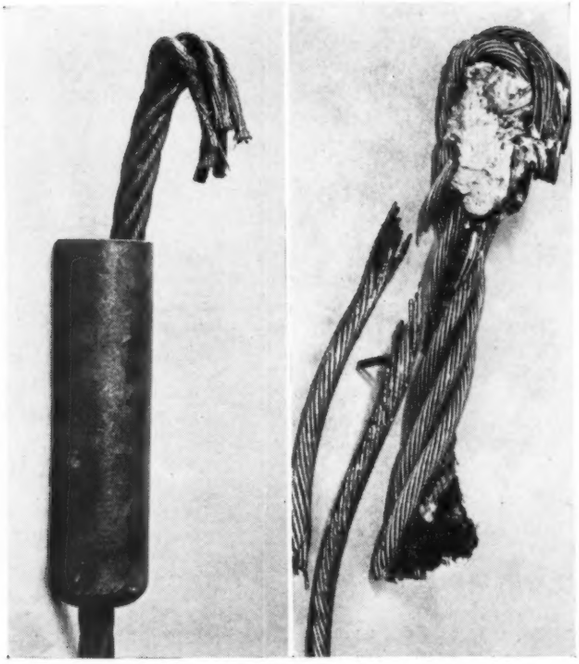
TEST No. 1

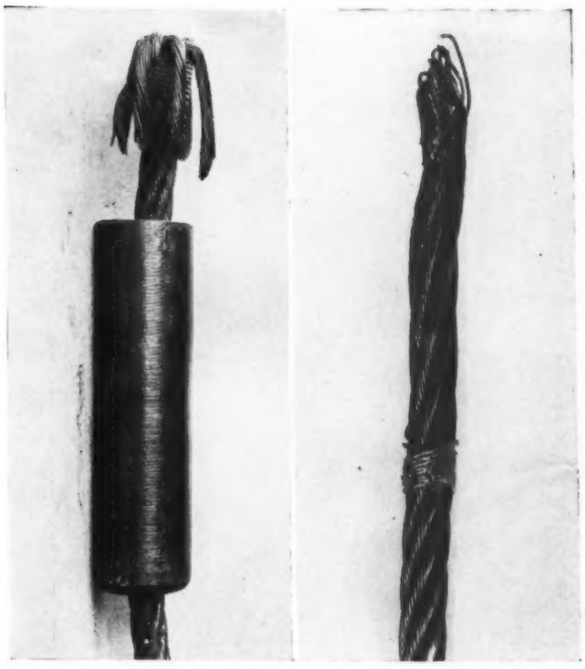


Before After

SOCKETING METHOD: All the strands were bent to one side and babbitted into the mandrel.

RESULTS: Rope started to pull out of the mandrel at 45,700 lb., or at 58.2 percent of the rope's strength; picked up load again to 50,000 lb. and slipped, then picked up load and broke two strands and hemp core *in mandrel* at 67,000 lb., or at 85.3 percent of the rope's strength.

TEST No. 2

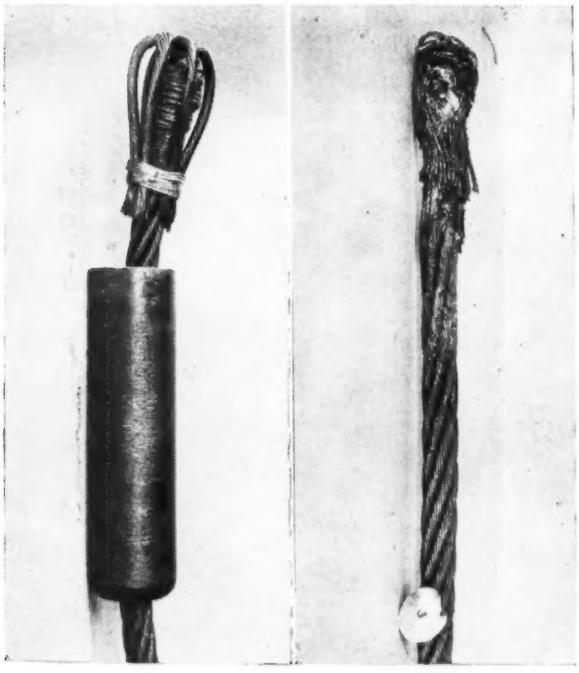


Before After

SOCKETING METHOD: All the strands were bent over a tie wire, spaced around the rope and babbitted into the mandrel.

RESULTS: Fastening held up to 43,500 lb., or to 55.4 percent of the rope's strength, and then started to pull out; picked up load again to 61,700 lb., or to 78.6 percent of the rope's strength, by which time the rope had pulled 2⅜ in. out of the mandrel; the rope continued to pull out faster, the load diminishing to around 12,000 lb. until the rope pulled out about 5 in., after which the load dropped to zero as the rope continued to pull out entirely.

TEST No. 3

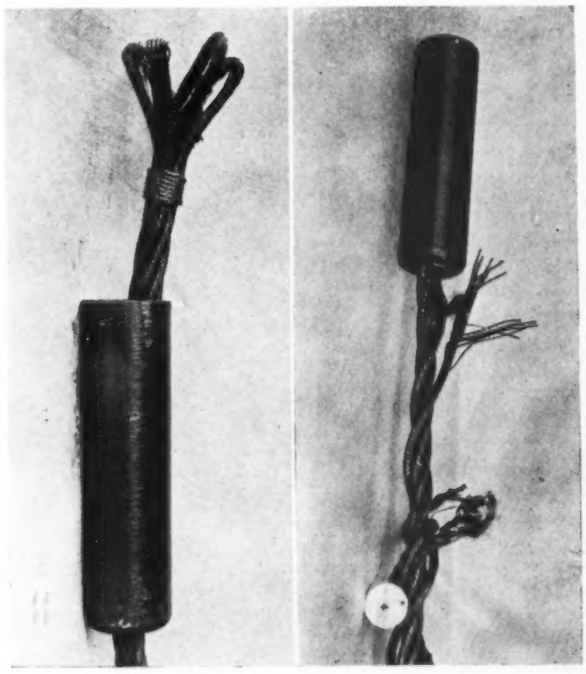


Before After

SOCKETING METHOD: Socketed similar to No. 2 except that strands were bent back over a soft-rope wrapping. *Dry* socket, no babbitt.

RESULTS: Pulled out of mandrel by jerks. There was no uniform pick-up of load up to 12,000 lb., by which time the rope had pulled 1¾ in. out of the mandrel. By the time the load reached 16,000 lb. the pickup in load had become fairly uniform and the rope had pulled out 5¾ in.; picked up load to 37,000 lb., or to 47.1 percent of the rope's strength, then rope pulled all the way out of the mandrel at about 700 lb. load.

TEST No. 4

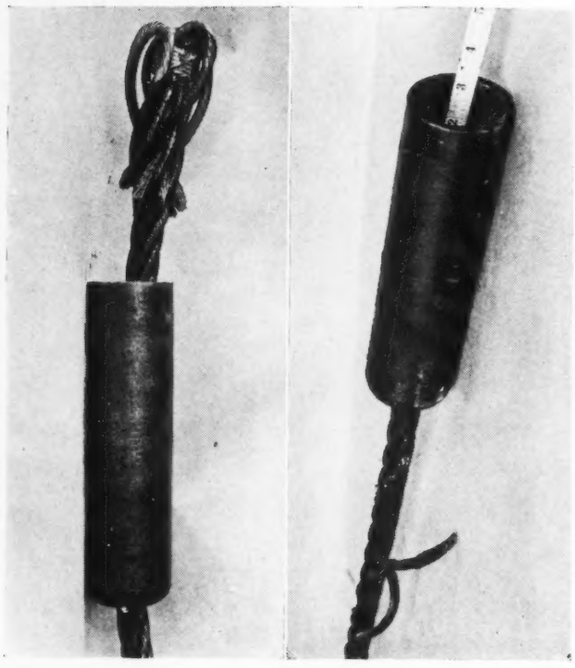


Before After

SOCKETING METHOD: Socketed similar to No. 2 except that the strands were bent *in* toward center and babbitted into the mandrel.

RESULTS: Picked up load to 10,000 lb. and wire started to pull out of the mandrel; then picked up load to 52,000 lb., or to 66.2 percent of the rope's strength, when rope again slipped, having pulled 1¼ in. out of mandrel; picked up load again breaking three strands and hemp core *in mandrel* at 73,110 lb., or at 93 percent of the rope's strength.

TEST No. 5

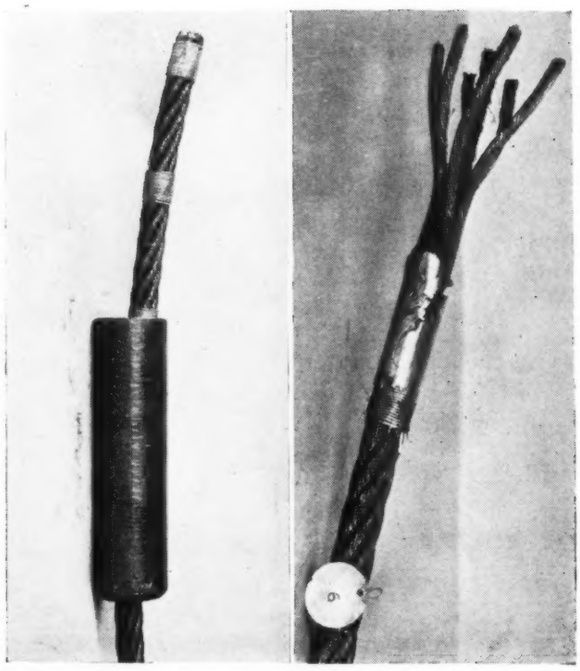


Before After

SOCKETING METHOD: All the strands were bent back over a tie wire as in No. 2, but each strand was given one splice tuck. *Dry* socket, no babbitt. Known as "Prosser" type.

RESULTS: Picked up load slowly to 4000 lb., at which load the rope had pulled out 1½ inch. Then pulled steadily to 12,000 lb., at which load the rope had pulled out 2 in.; then picked up load more steadily breaking one strand *in mandrel* at 72,120 lb., or at 91.8 percent of the rope's strength, the rope having pulled out 3 inches.

TEST No. 6



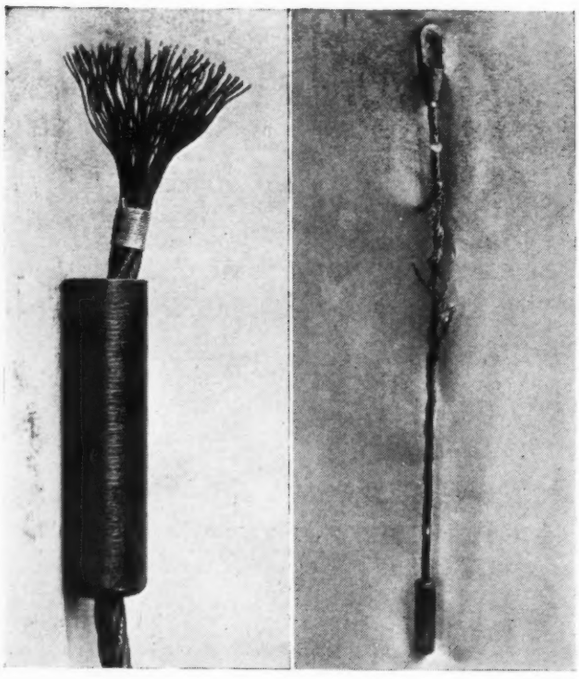
Before After

SOCKETING METHOD: Rope was cleaned in gasoline and dried, then babbitted without unlaying the strands.

RESULTS: Rope held in mandrel to 26,000 lb., or to 33.1 percent of the rope's strength, and then pulled out at a steady load of 19,500 lb., or 24.8 percent of the rope's strength, causing the babbitt to shear off and leave a coating of babbitt on the rope and the rest of the babbitt on the inside of the mandrel.

TESTS Nos. 7 & 8

Before After



TEST No. 7

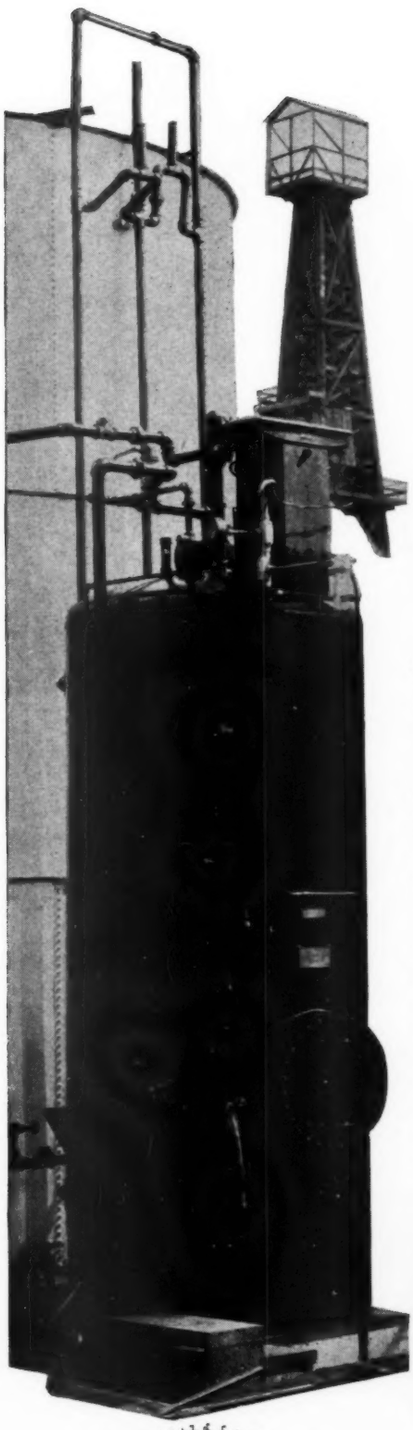
SOCKETING METHOD: The rope ends for the mandrel were "mule-tailed" according to usual wire rope shop practice. After "mule-tailing" the wires they were cleaned carefully with gasoline and dried; the mandrel was then poured with babbitt.

RESULTS: Rope held to 68,000 lb., at which load there was a slight jar on the rope from slipping in the mandrel, the rope having pulled out 3/16 in.; then picked up load to 78,400 lb., at which load three strands and the hemp core were broken in the clear between sockets. (This was an exceptionally high test for babbitt and was due to the thorough cleaning of the wires; frequently the babbitt shears, allowing the wires to pull out at a lower value).

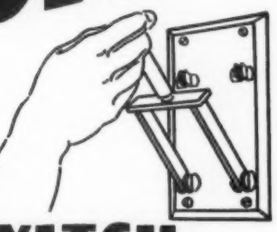
TEST No. 8

SOCKETING METHOD: The rope ends for the mandrel were "mule-tailed" according to usual wire rope shop practice. After "mule-tailing" the wires they were cleaned with hydrochloric acid, rinsed in hot water, and the mandrel as well as the wire rope socket were poured with *zinc*.

RESULTS: No movement of rope in either fitting; three strands and the hemp core of the rope broke near middle of sample as shown, with the full rope strength of 78,550 lb.



Produce PIPE LINE OIL Merely by THROWING A SWITCH



The production of any well can be changed instantly from "cut" oil to clean oil merely by switching on the electric current, when Petreco Electroflow Dehydration is utilized.

This method provides a direct line for the "cut" oil — from the well, through the dehydrator, to dry stock. The emulsified production flows directly through the dehydrator after leaving the well head, just as it would flow through a gas trap. When it leaves the dehydrator it is pipe-line oil, ready for clean oil storage. Treating is easier, more economical; results are better; there is less waste, and minimum losses. Savings due to the elimination of wet oil storage tanks frequently are sufficient to cover the entire cost of installation.

Petreco engineers will be glad to demonstrate the applicability of Petreco Electroflow Dehydration to your own cut oil problem without obligation.

A Direct Line—From The Well, Through The Dehydrator, To Dry Stock

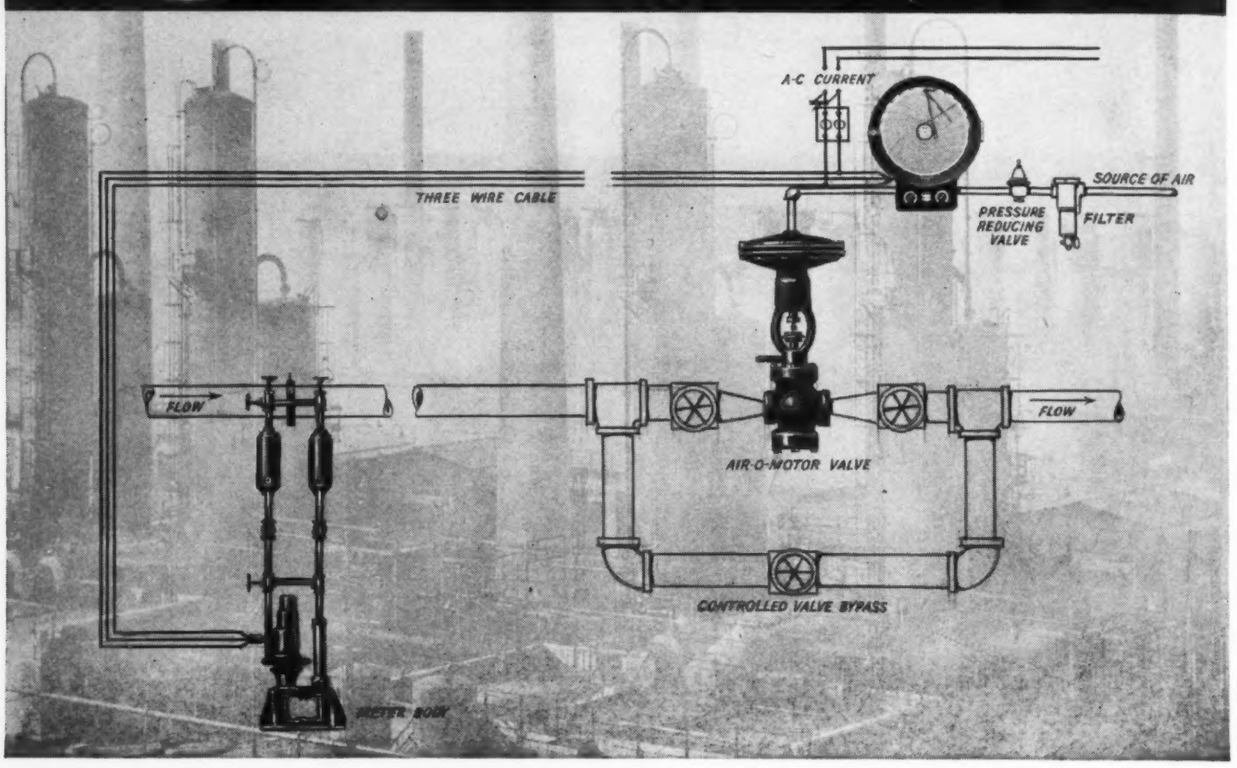
PETRECO

ELECTROFLOW DEHYDRATION

PETROLEUM RECTIFYING COMPANY OF CALIFORNIA

General Offices: 530 West Sixth Street, Los Angeles, California. Branch Office: Houston, Texas. Branches and Service Men In Principal Oil Fields.

Air-o-Line Solves the OF REMOTE RECORDING



Combines.. REMOTE FLOW RECORDING

"Tunes In" to PROCESS CONTROL
as easily as dialing a radio

A simple screw-driver adjustment of the graduated "Automatic Reset and Throttling Range Dials" gives you exact control of temperatures, pressures, flows and liquid levels.

There is no guesswork or dismantling of the instrument to obtain the desired control results. You can see how adjustments for different operating conditions can be noted and duplicated at any time.

Once adjusted, Air-o-Line is fully automatic.

In process flow control where it is desirable to locate, at a considerable distance, the recording controller from the point of measurement — Brown Air-o-Line Flow Controllers operating on the "electric inductance bridge principle", fulfill every requirement for remote recording and positive control of flow in refinery processes.

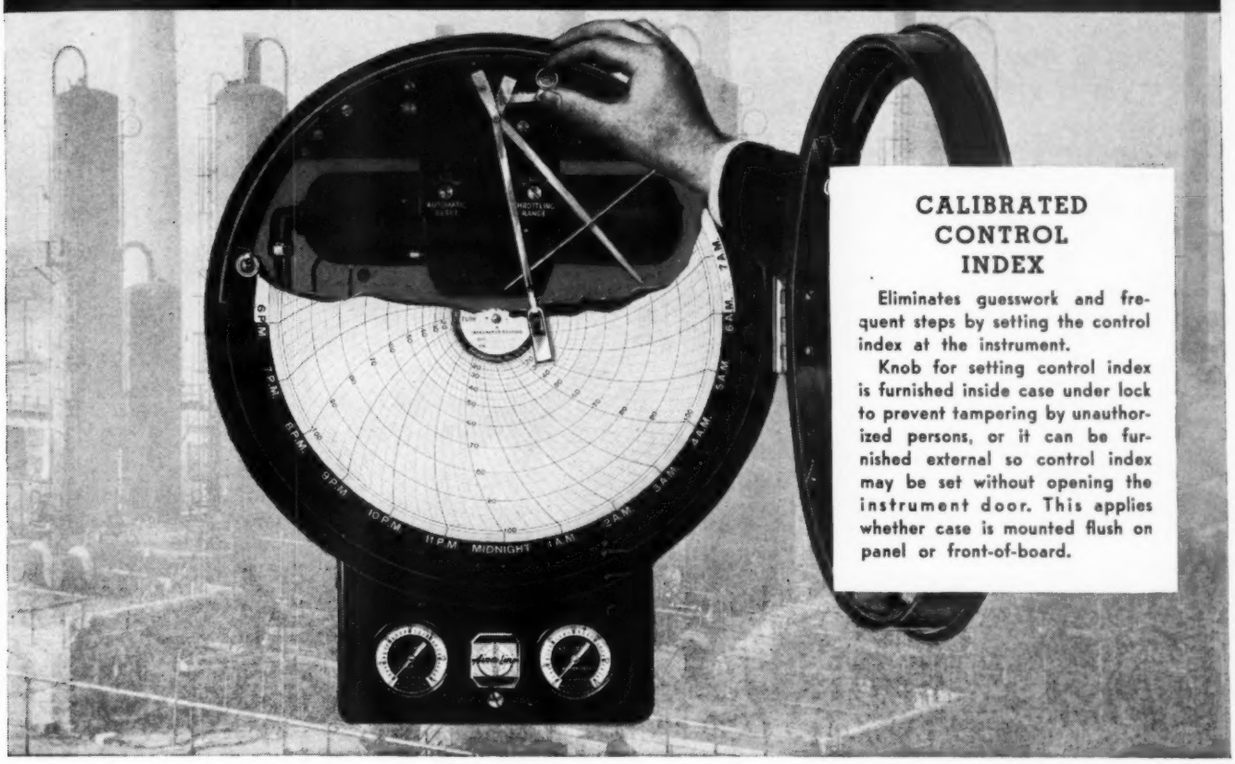
The Brown Air-o-Line Flow Controller is the only electric flow meter that offers the desirable combination of electric recording with air operated control and remote control setting by means of a calibrated control index.

The air control mechanism of Brown Air-o-Line is mounted inside of the recorder case. A turn of the calibrated control index makes it possible to set the desired flow control at the recording controller, which is mounted on the centralized instrument control board.

Only Brown Air-o-Line flow-controllers offer this outstanding advantage — which saves time in putting the controller in opera-

BROWN AIR

Problem . . .
AND CONTROL OF FLOW


CALIBRATED CONTROL INDEX
Eliminates guesswork and frequent steps by setting the control index at the instrument.
Knob for setting control index is furnished inside case under lock to prevent tampering by unauthorized persons, or it can be furnished external so control index may be set without opening the instrument door. This applies whether case is mounted flush on panel or front-of-board.

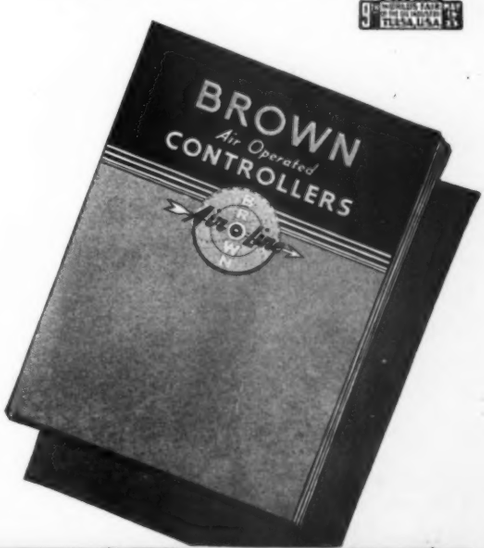
with Air Operated Control

tion and insures better co-ordination of flow with the other variables to maintain balanced operation.

Air-o-Line flow controller is suitable for working pressures up to 2500 lbs. per square inch — equipped with the well-known Brown interchangeable range tube features — Air-o-Line flow and liquid level controllers are easily adapted to meet any operating condition.

The graduated "throttling range" and "automatic reset" dials make it possible to "tune in" to process control as easily as dialing a radio. All that is necessary is to set the control index — "tune in" throttling range and automatic reset; once adjusted, Air-o-Line becomes fully automatic. Learn more about Brown Air-o-Line flow controllers. Write for information. The Brown Instrument Co., *a division of Minneapolis-Honeywell Regulator Company,* 4475 Wayne Avenue, Philadelphia, Pa. Branches in all principal cities. Canadian Factory: 117 Peter Street, Toronto, Canada. European Address: Minneapolis-Honeywell Company, Wijdesteeg 4, Amsterdam.C.

See this instrument in operation at The International Petroleum Exposition—Booths 39 and 64.



Operated Controllers
OUTSTANDING PERFORMANCE WITH SIMPLICITY

PAUL WILLIAMS, petroleum engineer, formerly with the Pure Oil Company in the Gulf Coast, and more recently the United Gas Company, is now connected with the Trinity Portland Cement Company, with headquarters at Houston, Texas. He will give special attention to oilwell cementing problems.

S. T. McKENZIE, who recently joined the field sales organization of the S. R. Dresser Manufacturing Company, Bradford, Pennsylvania, for the present will confine his activities largely to the New England States. He has had a wide experience in the sale and distribution of valves, pipe joints, and allied products in many fields.

J. R. BRAYMER, of the Phillips Petroleum Company, has been transferred from the Wichita, Kansas, office to Bartlesville, Oklahoma, as junior petroleum engineer.

E. D. HARRIS recently was elected to the board of directors of the Northern Pipe Line Company, succeeding David Gregg, Jr.

J. R. McWILLIAMS, who recently was appointed general manager of production of the Standard Oil Company of Louisiana, has been made a vice-president of the company.

PREBEN OLDENBURG, formerly with the Shell Petroleum Corporation in the West Texas area, is now connected with the engineering staff of the California Company at Midland, Texas. Other changes announced by the company are: **H. W. MATTHEWS,** petroleum engineer, has been transferred from the Midland office to the Yates field; **JOE BALLANFONTE** is now in charge of drilling operations in the Ward field; and **T. A. POLLARD** is a new addition to the engineering department at Midland.

L. H. J. HERSCH, petroleum engineer with the Caribbean Petroleum Company, passed through New York recently en route from South America to London and The Hague.

RAYMOND C. WHEELER, manager of the gas department of the General Petroleum Corporation of California, has been elected to the board of directors of the company.

CLINT MOORE, engineer for the Phillips Petroleum Company, has been transferred from Shidler, Oklahoma, to West Texas.

GEORGE O. SUMAN has been appointed superintendent of the Associated Oil Company's San Joaquin Valley, California, division of development and production. **F. M. WATKINS** is the assistant superintendent.

A. L. WIEGAND recently resigned his position with the Phillips Petroleum Company to become associated as a petroleum engineer with the Standard Oil Company of Venezuela, Caripito, Venezuela, South America.

BERT RIDGEWAY, who has been at Wichita, Kansas, for the Empire Oil Refining Company, has been transferred to Mount Pleasant, Michigan, and placed in charge of the producing and land divisions of the company in that area. He succeeds **RAY HUNT,** who resigned recently to become vice-president and geologist for the Cry-Den Oil Company.

I. F. KORNEEKOV, vice-president and chief engineer of Maineft, at Neftegorsk, Baku; **V. V. POLIAKOV,** vice-president and chief engineer of Glavneft; **N. V. SAMOSTRELOV,** vice president and chief engineer of Bashneft; and **B. D. DYRTCHENKO,** vice-president and chief engineer of Grozneft, all of the U.S.S.R., are making an extensive tour of oilfields in the United States.

KENNETH G. PEARCE, petroleum engineer for the Carter Oil Company in the South Burbank field of Oklahoma, has been transferred to the Tulsa office of the company.

HARRY F. EMME has resigned as supervisor of the Pacific Division of the American Petroleum Equipment Suppliers' Association to accept a position with the General Petroleum Corporation. **WALTER F. PUSCH,** who has been Emme's assistant, will assume his duties.

JACK BARNES, petroleum engineer, formerly with the Magnolia Pipe Line Company, and prior to that in charge of production in East Texas for a group of independents, is now with the Trinity Portland Cement Company. He has his headquarters at Longview, Texas, and will cover all East Texas fields, as well as Rodessa, Louisiana, specializing in the solution of oilwell cementing problems.

FLOYD C. MERRITT, vice-president and general manager of the Elliott Core Drilling Company, Los Angeles, left his headquarters early in the month to attend the mid-year meeting of the A.P.I. at Tulsa, Oklahoma, where he is remaining for the International Petroleum Exposition.

CLIFFORD L. REESE, sales manager for Globe Oil Tools Company of Los Nietos, California, left Los Angeles on April 16th and will spend several weeks in the Gulf Coast and Mid-Continent areas on business for his company.

L. L. ANDERSON, vice-president and general manager of the Huasteca Petroleum Company, with headquarters in Mexico City, Mexico, made a trip to New York recently.

RICHARD ATKINSON, production superintendent in eastern Kansas for the Phillips Petroleum Company, has been transferred to the Burbank area of Oklahoma and placed in charge of production. **ROBERT JOLLY** has been transferred from Shidler to Wichita, Kansas, to take over Atkinson's vacated duties in that district.

"and when they saw this burnished tool joint they installed Protectors"

Unretouched Photo

When you see a burnished tool joint coming out of the hole it's a sure sign of friction somewhere down the line. Friction means wear on both the tool joint and casing. You can't *see* down in the hole. But danger lurks down there when tool joints rub and grind against the casing. Thin casing, caused by tool joint contact, leads to collapse, water intrusion and other troubles. Installation of Patterson-Ballagh Protectors eliminates the danger. When they are used the original tool marks stay on the tool joint. Friction is relieved. Drilling is speeded. Less power is required. Patterson-Ballagh Protectors will pay for their original cost over and over again.

New literature now ready

Patterson-Ballagh's

. . . *of course*

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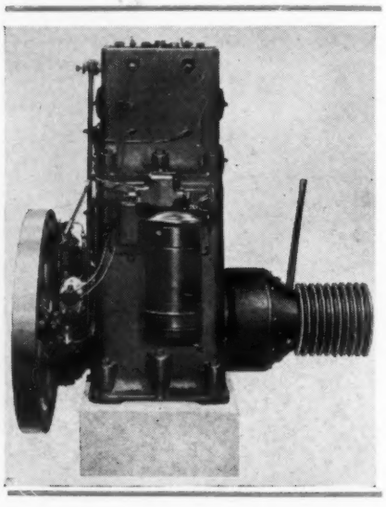
Fresh Stocks Carried at: Casper, Wyo.; Oklahoma City; Ada, Okla.; Lake Charles, Houma, La.; Hobbs, N. Mex.; Houston, Odessa, Texas; Kettleman Hills, Bakersfield, Ventura, Los Angeles, Calif.

SOLD BY ALL SUPPLY HOUSES

MACHINERY and EQUIPMENT

Cooper-Bessemer's Vertical Pumping Engine

RATED 40 hp. at 400 r.p.m., the "Type G-SD" has just been announced by The Cooper-Bessemer Corporation. The new vertical pumping



engine, a 2-cycle, is compact and light. It offers a number of field-proved advancements, developed over a period of several years, the manufacturers state. It is suitable for clutch or straight pulley drive.

The builders emphasize the low installation cost, low operating cost, and the very low consumption of lubricating oil. They point out that only a minimum housing, or none at all, is needed. A list of construction features includes the counterbalanced crankshaft, heavy-duty roller bearings, and modern-type crossheads.

Standard equipment on the new engine includes air filter, water pump, lubricating-oil pump, and lubricating-oil filter. Either a constant-speed or variable-speed governor can be supplied. Equipment for driving a radiator fan, or for automatic air starting, is optional.

Specifications of the new engine, facts about its convertibility to oil or gas fuel, space plans, and list of field installations —all are available from any of the Cooper-Bessemer district offices, or from the plants at Mt. Vernon, Ohio, or Grove City, Pennsylvania.

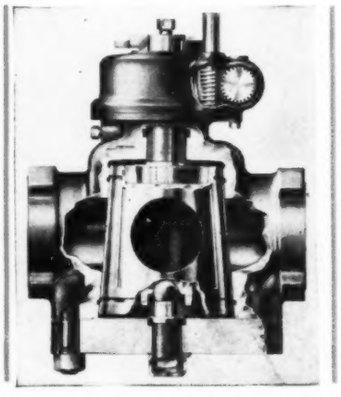
Ratigan Special Sucker Rod Elevator No. 106

THE Ratigan Special Sucker Rod Elevator No. 106, manufactured by J. P. Ratigan, 1213 Santa Fe Avenue, Los Angeles, California, is heat treated, and was tested in pulling a 7/8-in. sucker rod. The rod started to yield at 60,000 lb., and the elevator was in good operating condition when examined, the manufacturers state. This elevator will handle 3/4-in. and 7/8-in. rods, and most makes of 5/8-in. rods on one side. The other side will take all makes of 5/8-in. rods. The makers recommend that one side be used for all size rods if possible. The reason is, the movable rod seat is extra hard, and surrounds the up-set of the rod, which eliminates any chance of kinking the sucker rod. The hardened movable rod seat, also, has two more functions. It acts as a safety latch with other means attached to it, and it is so arranged in the elevator body that it can rock slightly, which will allow the different up-set tapers in the different make sucker rods to seat themselves without sticking. This tool was carefully planned, so that one elevator will take care of all size and make of rods, excluding one make, the old titan rod.

When hoisting rods that are laid on the ground it is advised that the elevator should not be turned around. The combination seat and latch is half of the up-set seat for the rod, and is level with the body, in which is the other half seat. When the rod is seated the up-set is surrounded back and front, and for this reason the elevator does not have to be turned around. It cannot lose the rod.

Round Opening Drilling-Through Valve

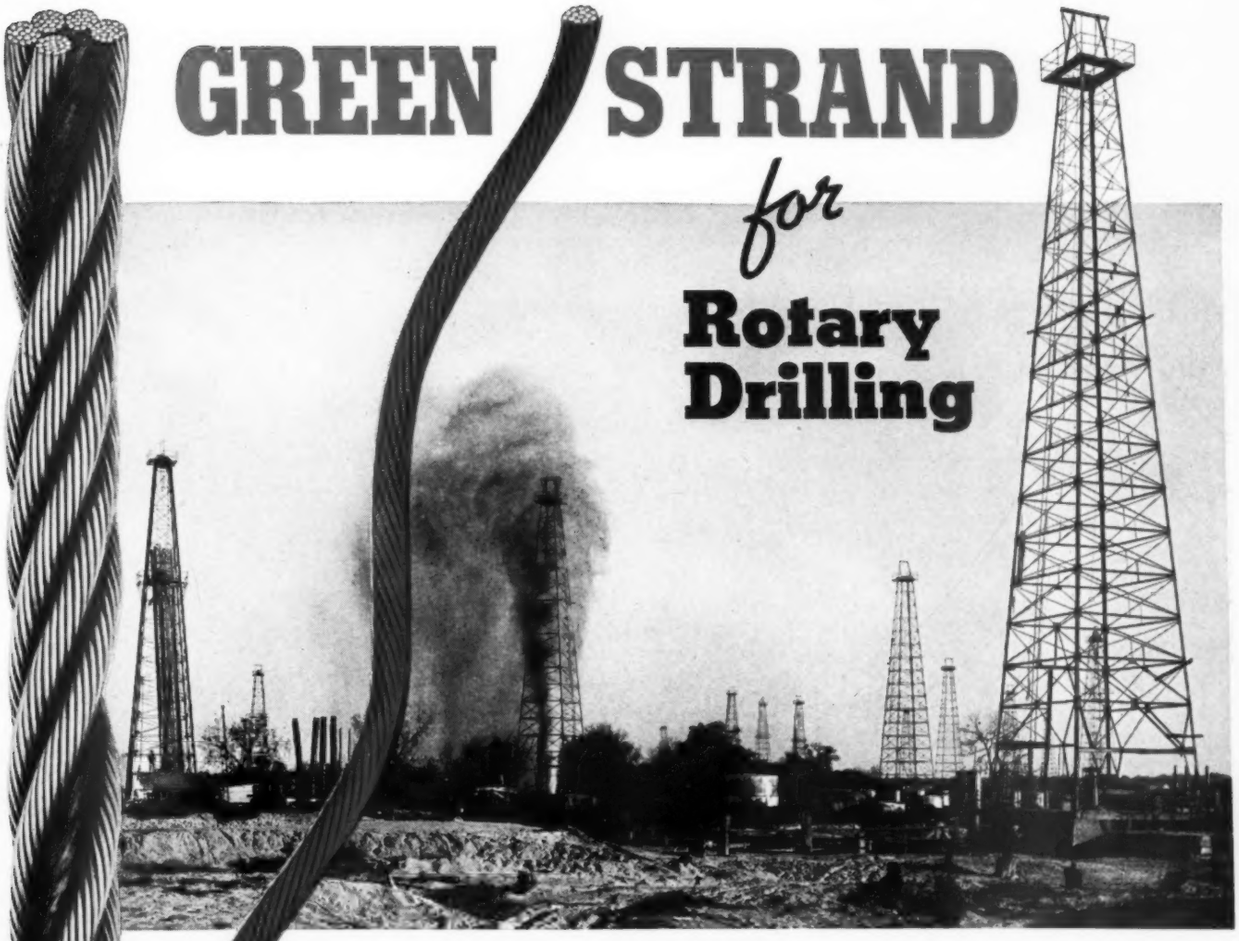
A NEW round opening cast alloy steel valve for use in connection with well heads and Christmas trees has been developed by the manufacturers of Nordstrom lubricated valves. It is used primarily as a master control valve and for drilling-through service on oil wells. This advanced design is known as the



Round Opening Hypreseal valve. Developed for high pressures and positive shutoff, the port is large enough to permit passage of drilling tools and tubing. The interior of the valve, when open, presents a smooth, continuous surface, permitting unrestricted flow and avoiding channeling. Present sizes include 6-in. and 7-inch. The 7-in. size weighs approximately 2300 lb. and is tested to 6000 lb. pressure. The body is made of Nordco cast steel that has a very high tensile strength and the plug and stem are alloy steel.

In this round opening valve the plug is inverted. Seating of the plug is effected by means of one steel ball adjusted through an impervious sealing diaphragm by one single screw. The single heavy-duty ball-bearing affords positive, accurate thrust without distortion or unbalanced load, the manufacturers state. The shank, which takes a great portion of the load, is threaded into the valve body and has a multiple-pressure lubricant seal that precludes any possibility of leakage through the threads. These threads carry the thrust and are positively sealed. The gear housing is entirely enclosed. So rugged is the Nordstrom Hypreseal made in all details that no field adjustment is normally required, it is stated. No part of the plug itself is at any place exposed to the atmosphere. It is a truly full-floating member. Further details may be obtained from Merco Nordstrom Valve Company, 400 Lexington, Pittsburgh, Pennsylvania.

GREEN STRAND *for* Rotary Drilling



● Hazard's LAY-SET Preformed Green Strand is preferred by an ever increasing number of drillers because:

1st—LAY-SET Green Strand is made of Improved Plow Steel—the true *service metal* for rotary lines;

2nd—LAY-SET Green Strand is preformed.

In LAY-SET Preformed Green Strand Rotary Lines there are no life-shortening stresses; no cranky resistance. Being preformed, LAY-SET Green Strand lines are . . . much easier to thread through the traveling block, crown block, and eye in drum. . . . do not have to be back-twisted. . . . whip less at high speeds. . . . spool tightly, even under the light weight of the idle block. . . . resist kinking and require no seizing.

These several features, characteristic of LAY-SET Preformed Green Strand, mean longer service life, lower replacement labor costs, fewer shutdowns, steadier drilling.

Write for complete details.

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Wilkes-Barre, Pennsylvania
An Associate Company of the American Chain Company, Inc.
In Business for Your Safety
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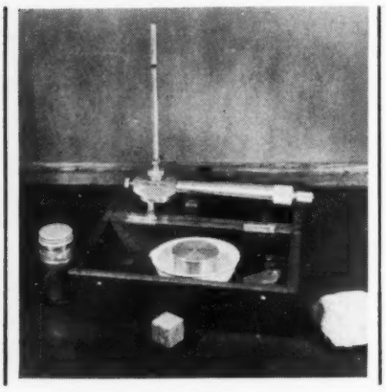
GREEN SIGNIFIES SAFETY

LAY-SET *Preformed* Rotary Lines

ALL HAZARD WIRE ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE GREEN STRAND

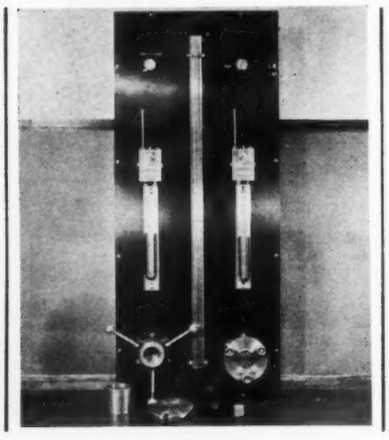
Instruments for Determining Porosity and Permeability of Cores

TWO new instruments for testing cores have been introduced to the industry by Walter Ruska & Company, Inc., of Houston, Texas. For determining the porosity of a core sample a Porometer, consisting of an air-tight container or cup to which is attached a metering



Porometer

piston for measuring displacement volumes, has been devised. Height in a small capillary tube is employed to determine reference pressures. In order to determine the porosity of the sample, the bulk of the core is determined by mercury displacement in the cup. To determine the available pore space the core sample is placed in the container and the air compressed by the metering piston. Secondly, the volume of mercury displaced by the core is then placed in the container and the pressure in the container again brought to that previously obtained with the core sample in place. Since the air can be compressed in the pore space of the sample, the two readings on the metering piston will vary and the difference indicates the porosity of the sample. The instrument is contained in a small mahogany case 9 in. by 6 in. by 4 in., the total weight being six and one-half pounds.



Permeameter

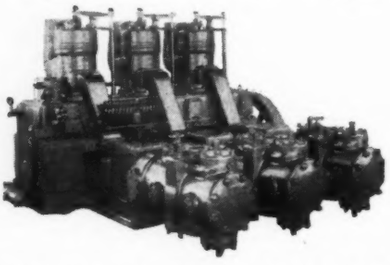
The Permeameter measures the flow rate of air of a given pressure and temperature through a core sample of definite cross-sectional area and length. The equipment is mounted on a Bakelite panel and consists of a pressure gauge, a flowmeter, and a core holder. One of the features of the Permeameter is the precision of the flowmeter. Extreme accuracy is obtained by means of a delicately measured interchangeable orifice meter, the manufacturers state. This flowmeter may be used for other purposes and may be bought separately.

The instruments show fine workmanship and have a neat appearance. The company contemplates increasing the line of well-testing equipment and is now developing a new bottom-hole sampler.

For additional information write Walter Ruska & Company, Inc., Scientific Instruments, 929 Bankers Mortgage Building, Houston, Texas.

Clark Compressor Unit

ACCEDING to the demand for an engine-driven compressor that may be installed quickly and easily moved at low expense, Clark Bros. Co., Olean, N. Y., have announced a series of right-



angle, two-cycle machines in five sizes from 165 hp. to 400 hp.

The Clark right-angle super two-cycle engine is a recent development in gas engine driven compressors that reduces the floor space required, foundation, building and installation costs, states the manufacturers. This engine features the Clark super two-cycle injection system full force feed lubrication, a new development of scavenging two-cycle engines that, they state, greatly increases the power available. The running gear of this engine is very accessible and many new details of construction and design are incorporated in the Clark super two-cycle engine, it is pointed out.

High Early Strength Cement

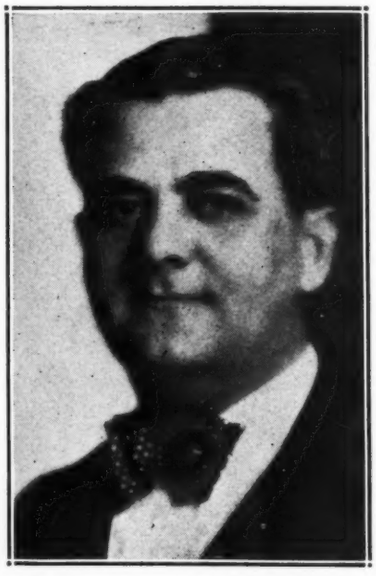
A HIGH early strength portland cement known as "Trinity High Early" has been developed by the Trinity Portland Cement Company. According to an announcement by the company, this cement has been developed especially for oilfield use, and has a particular application in oilwell cementing. Although it develops a high early strength, permitting the drilling of the plug in a well after 48 hours instead of the usual 72 hours or more, the manufacturers state that its early viscosity is not increased sufficiently to interfere with the placement of the cement—even in deep wells.

"Trinity High Early" passes all the requirements of the A. S. T. M. tentative specifications for high early strength cement.

Uniformity and freshness of product are emphasized by the company in its manufacture and distribution. Three plants, at Dallas, Fort Worth, and Houston, Texas, are ideally situated for maintaining efficient distribution facilities throughout the oilfields of the state. In addition, the company recently has added an engineering service department to deal with oilwell cementing problems and the use of cement in the oilfields.

Maloney Appoints James A. Morgan Sales Manager Mid-Continent District

Maloney Tank and Manufacturing Company, Tulsa, Oklahoma, announces the recent appointment of James A.



Morgan as sales manager for the Mid-Continent district.

Jim, as he is familiarly known to thousands in the oil fraternity, has a background of wide experience, having been identified with sales work in the industry for 20 years. His previous connections include service with major supply companies and major oil companies, as well as with oil equipment manufacturers.

According to J. S. Warren, vice-president and general manager of Maloney Tank and Manufacturing Company, the addition of Morgan to the firm's sales staff was necessitated by the increased demand for the company's products, and places them in a position to better serve the steadily growing number of users of Maloney tanks.

MASTER
CORE DRILL OF ALL TIME

The Elliott Model "A" Combination Core Drill embodies all that fifteen years of intensive, specialized research, study and actual coring experience have enabled the world's leading oil well coring engineers to develop and build into a tool designed to obtain maximum footage and recoveries of satisfactory cores, in all formations, in any well, at minimum operating and maintenance costs, with the highest possible factor of safety in service.

It is the result of Elliott's long years of achievement —a scientifically designed tool that is manufactured of the best materials, for the toughest service, and engineered to meet actual conditions as they exist in the hole—the finest, most efficient, dependable and safe coring equipment that able engineering, practical experience, fine materials and precision manufacture can produce.

It is adapted to all well, field and operating conditions, with two types of cutter heads for the complete range of formations. One set of coring equipment for all coring requirements, assuring minimum investment.

Write for Bulletin No. 36-R.

ELLIOTT CORE DRILLING COMPANY

4731 East 52nd Drive, Los Angeles, California
Export Office: 420 Lexington Ave., New York City

Elliott Hard Formation Cutter Head for coring the hardest, toughest formations.

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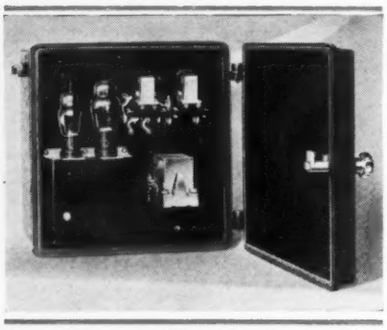
FOR ALL

Formations
Well Conditions
Field Conditions
Operating Conditions
Coring Requirements

Elliott Combination Core Drill completely assembled, with regular type cutter head, for coring all soft and average formations. Interchangeable with hard formation heads of similar sizes.

Protectoglo System of Combustion Safeguard

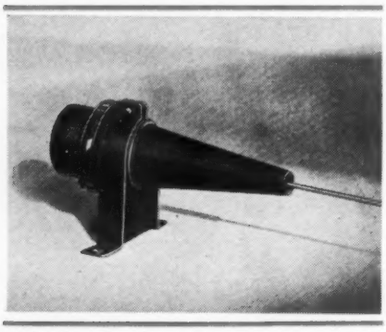
A NEW line of Protectoglo equipment has been placed on the market by The Brown Instrument Company, a division of Minneapolis-Honeywell Regulator Company, Philadelphia, Pennsylvania. This apparatus includes two separate and distinct types of relays, and a flame sensitive electrode that also can



be used as a special spark plug for electric ignition. Any of the standard line of primary controllers and motor valves are used to complete the system of combustion safeguard.

The development of this equipment came only after several years of field experience with the old Protectoglo System, manufactured by the Minneapolis-Honeywell Regulator Company, had proved that the utilization of the electrical conductivity of the flame itself provides the greatest possible measure of safety and reliability that engineers have been able to incorporate simply and positively in any combustion safeguard, the manufacturers state.

The relays contain the thermionic tubes for rectification and amplification of the power input that, when conducted from



the electrode unit to ground through the flame, operates the relay units controlling the operation sequence, main fuel valve, etc. Obviously any interruption in the circuit to ground through the flame (flame failure) causes instantaneous and positive shut-down.

The cast-iron dust and moisture-proof relay cases are of the universal type for either front of board or flush mounting.

Outstanding features of the Protectoglo System are:

1. Standard radio type vacuum tubes are used, assuring long tube life.
2. The vacuum tubes are placed in the relay case where they are well protected and under lock and key.
3. The relay can be placed in any remote location with reference to the electrode unit.
4. The relays are housed in a rugged cast-iron case.
5. A rubber gasket is used on the hinged relay cover, making the case dust- and moisture-proof.
6. Combination door handle and built-in key lock on relay cases.
7. The terminal board is in a separate moisture-proof chamber in the relay case.
8. Electrode unit contains no moving parts and is of a very rugged design.

A system of combustion safeguard can be supplied for practically any type of burner equipment, it is stated. Requests for catalogs and information descriptive of this new equipment should be addressed to The Brown Instrument Company, a division of Minneapolis-Honeywell Regulator Company, Philadelphia, Pennsylvania.

Industrial Mountings for High-Intensity Mercury Lamps

FOR industrial lighting using the new 400-watt high-intensity mercury lamp several new lighting fixtures are announced by Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pennsylvania. The new high-, medium- and low-mounting reflectors of

aluminum are suitable for mounting heights of 18 ft. or more; the new one-piece Glassteel Diffuser is designed for mounting heights of less than 18 feet.

The high mounting reflectors are made from commercially pure "etching grade" aluminum sheet. The Mogul type skeleton socket with high-heat wax and nickel-plated interior is held in place by a cast-brass adapter that is locked to the reflector by means of a special cast aluminum cap.

Reflectors are supplied for ½-in. conduit mounting. The outside surface of the reflector is protected by one coat of glossy green baked enamel. The reflecting surface is prepared by acid etching.

For Low Mounting

Westinghouse 24-in. High Intensity Glassteel Diffusers are drawn from Armco Iron and are finished with one ground coat and two white coats of porcelain enamel inside and outside. This reflector uses the same socket and holding construction as the aluminum reflectors. The glove is of Monax single-layer homogeneous glass and is equipped with a copper globe protecting ring.

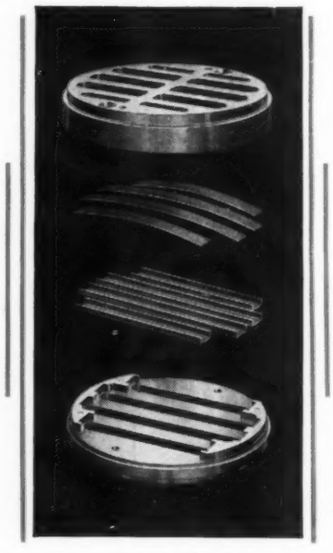
The Channel Valve of Ingersoll-Rand Company

A NEW development in valve design that may be of great importance to air and gas compressor users is the Channel Valve, recently announced by Ingersoll-Rand.

In designing the Channel Valve, a greater-than-usual portion of the valve opening is utilized, which tends toward

slower air speeds through the valve ports, the manufacturers state.

The only moving parts of the new valve are a number of "valve channels", within each of which is a flat spring. The spring fits snugly within the channels so that when the valves lift, the springs straighten and a small quantity of air is trapped between springs and channels. Thus are formed air cushions whose function it is



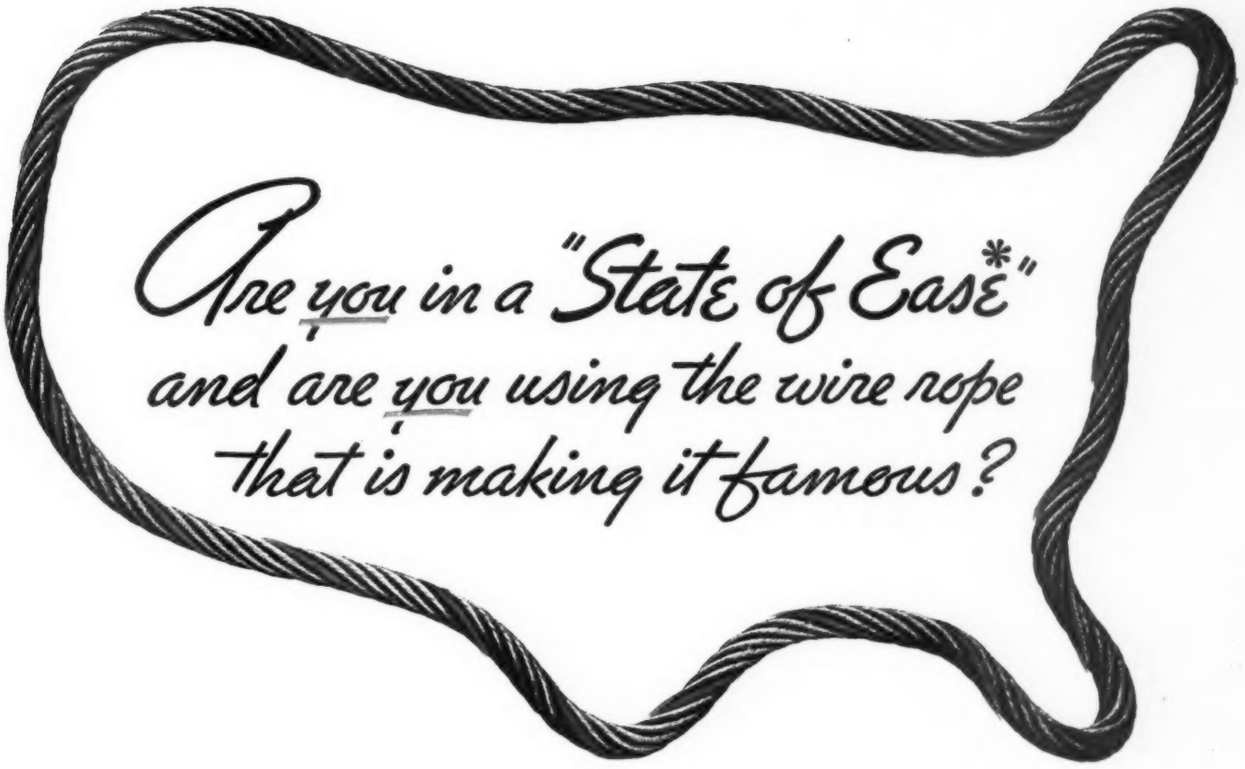
to decelerate the valve channels after opening and bring them to a stop softly and quietly without impact.

The successful accomplishment of this makes a quiet, practically silent, valve. The total elimination of impact means that one of the conditions usually most destructive to compressor valves no longer has to be considered, it is stated. Valve channels consequently can be (and are) made light in weight, their channel form being relied upon for strength and rigidity. They lift straight off the seat without flexing, returning to the same position.

Springs, also, can be (and are) designed solely as springs because they are not called upon to act as valves.

Virtually all new I-R compressors are being supplied equipped with the Channel Valve.

To introduce the new valve, Ingersoll-Rand has published a new bulletin, a copy of which will be mailed on request by Ingersoll-Rand Company, 11 Broadway, New York City.



* The term "State of Ease" is taken from Slocum and Hancock's book "Strength of Materials" which quotes Prof. Karl Pearson: "A body which is free from internal stress is said to be in a STATE OF EASE."

ARE you, as a wire rope user, in a "state of ease"? Are you easy in mind—sure you are getting all that wire rope should give you? Are you using the wire rope that is "free from internal stress"?

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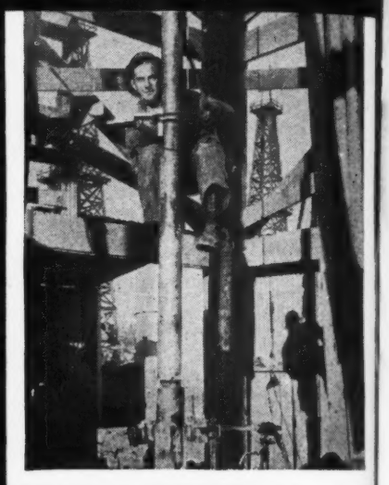

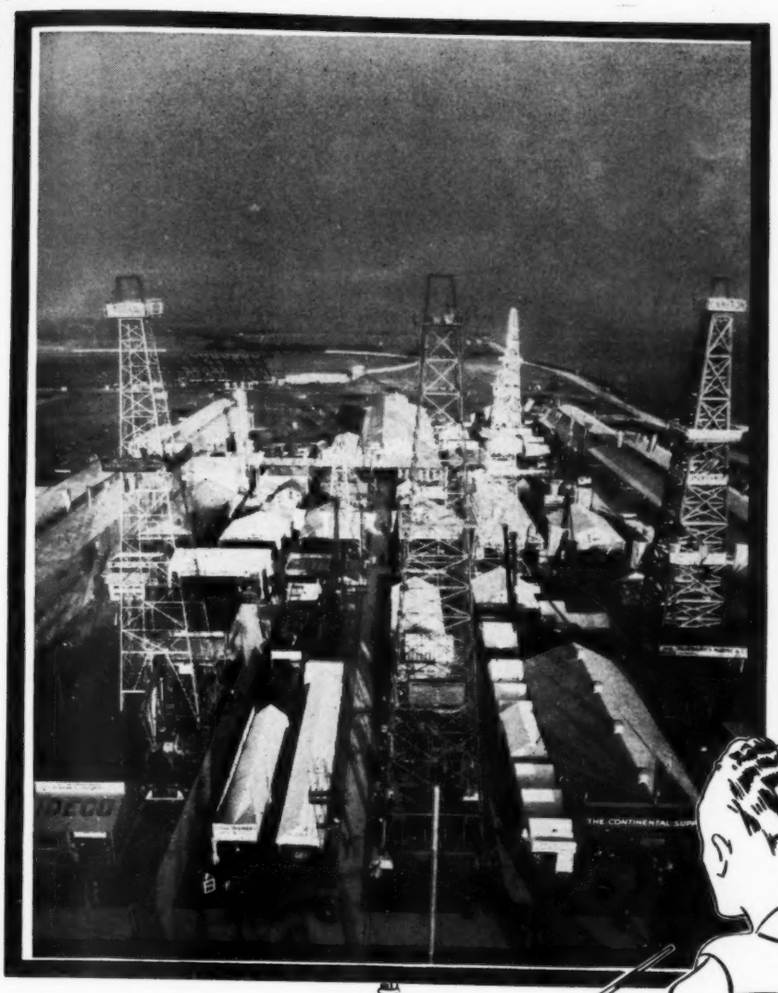

PRESENTS

THE 1936

SKETCH

TULSA OKLAHOMA

SEE THESE BAKER TOOLS

1 BAKER CEMENT FLOAT SHOE
2 BAKER CEMENT FLOAT COLLAR
3 BAKER CEMENT WHIRLER SHOE
4 BAKER CEMENT GUIDE SHOE
5 BAKER MODEL F CEMENT RETAINER

A hearty Baker Welcome awaits all visitors to the Tulsa Exposition, May 16 to 23, 1936! In Booths 99 and 112 of the Oklahoma Building, full size models, and moving displays will be demonstrated by Practical Baker Representatives. You are cordially invited to pay us a visit!

1

With the adoption of "red" concrete as standard, Baker Cement Float Shoes provide maximum efficiency. The Bakelite ball valve double-seals against rubber backed by Bakelite at the slightest reversal of pressure; the special made shoe, with plug and valve made of Bakelite and Baker-formula concrete, is stronger than the casing; the complete "drillability" of both concrete and Bakelite eliminates any delay or danger when drilling out and drilling up — absence of metal leaves the hole always ready for immediate coring or "straight-hole" drilling.

2

Many operators use a Baker Cement Float Collar to stop the cementing plug a joint or two above bottom and retain cement "tailings" *inside* the casing. Internal construction is the same as the Baker Cement Float Shoe, and all advantages are retained. Used with a Baker Cement Guide Shoe for average length strings, or with a Baker Cement Float Shoe where an extra measure of safety is desirable.

3

More and more operators are adopting the Baker Cement Whirler Shoe as the "ultimate" device of its kind. It includes all the features of efficiency and safety present in the Baker Cement Float Shoe, with a "plus value"! A number of baffled side ports lead out from the valve chamber and serve to direct the cement upward with a whirling motion that insures complete, even distribution around the casing and minimizes danger of channeling.

4

Baker Cement Guide Shoes possess the vital Baker Drillability feature, and are used in combination with Baker Cement Float Collars, described above.

5

The Baker Model F Cement Retainer with Circulation Jar provides for the placement of cement in a well, under pressure, through tubing or drill pipe. Particularly adaptable where circulation cannot be secured, or can be broken only under great pressure; also used as

BAKER

s at TULSA

a Casing Bridge Plug. This efficient device is applied for Re-Cementing, Series Cementing, Cementing Behind Sections of Pipe, Plugging off Bottom Water or Plugging Back to Upper Zones, and other uses.

6

Baker Rotary Wall Scrapers are being universally used for (a) scraping rotary mud from the productive sand for bringing in a bigger well easily and in less time; (b) enlarging the hole to permit placing of a thicker body of cement around shoe and casing; (c) wall-scraping a larger diameter for setting casing in "tight" holes, or running liners without turning down couplings; and many other purposes. The blades are opened by hydraulic pressure from the pumps, and always close when their work is done — thus providing maximum safety.

7

The advantages of a back-pressure valve in the drilling string are well known, but not until the "threadless valve" was introduced in the Bakwik Drill Pipe Float were operators unanimous in approving such devices. The Bakwik Float body need not be removed from the string at any time, as the valve assembly is quickly and easily removed or replaced by hand. Its many advantages are described in the Baker Catalog, and on Pages 205 to 207 of the 1936 Composite Catalog.

8

The Baker Rotary Wall Sampler takes *cores from the side walls* of a drilled hole, operating at any depth in a safe and efficient manner. The complete Wall Sampler is a "double value" investment, since the body is identical to the Baker Rotary Wall Scraper and by *changing blades only* you can perform the many profitable operations described under Paragraph 6 above.

9

The Baker Cable Tool Core Barrel is unequalled for taking cores from all formations by the cable tool method. Accurate, complete cores are secured at low cost, and any experienced driller can operate it successfully.

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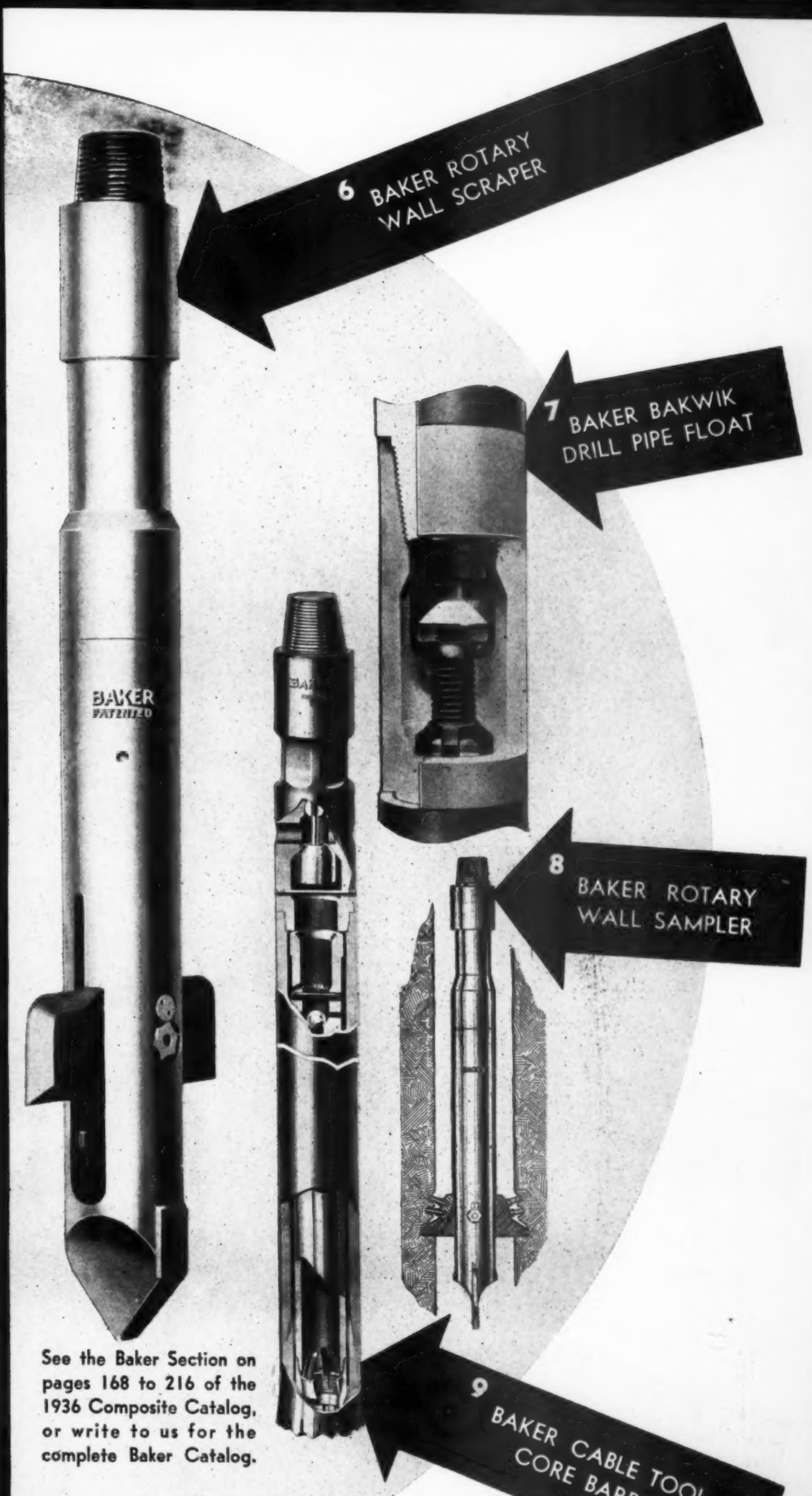
6 BAKER ROTARY WALL SCRAPER
7 BAKER BAKWIK DRILL PIPE FLOAT
8 BAKER ROTARY WALL SAMPLER
9 BAKER CABLE TOOL CORE BARREL
BAKER
PATENTED

See the Baker Section on pages 168 to 216 of the 1936 Composite Catalog, or write to us for the complete Baker Catalog.

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Natural Gasoline Men

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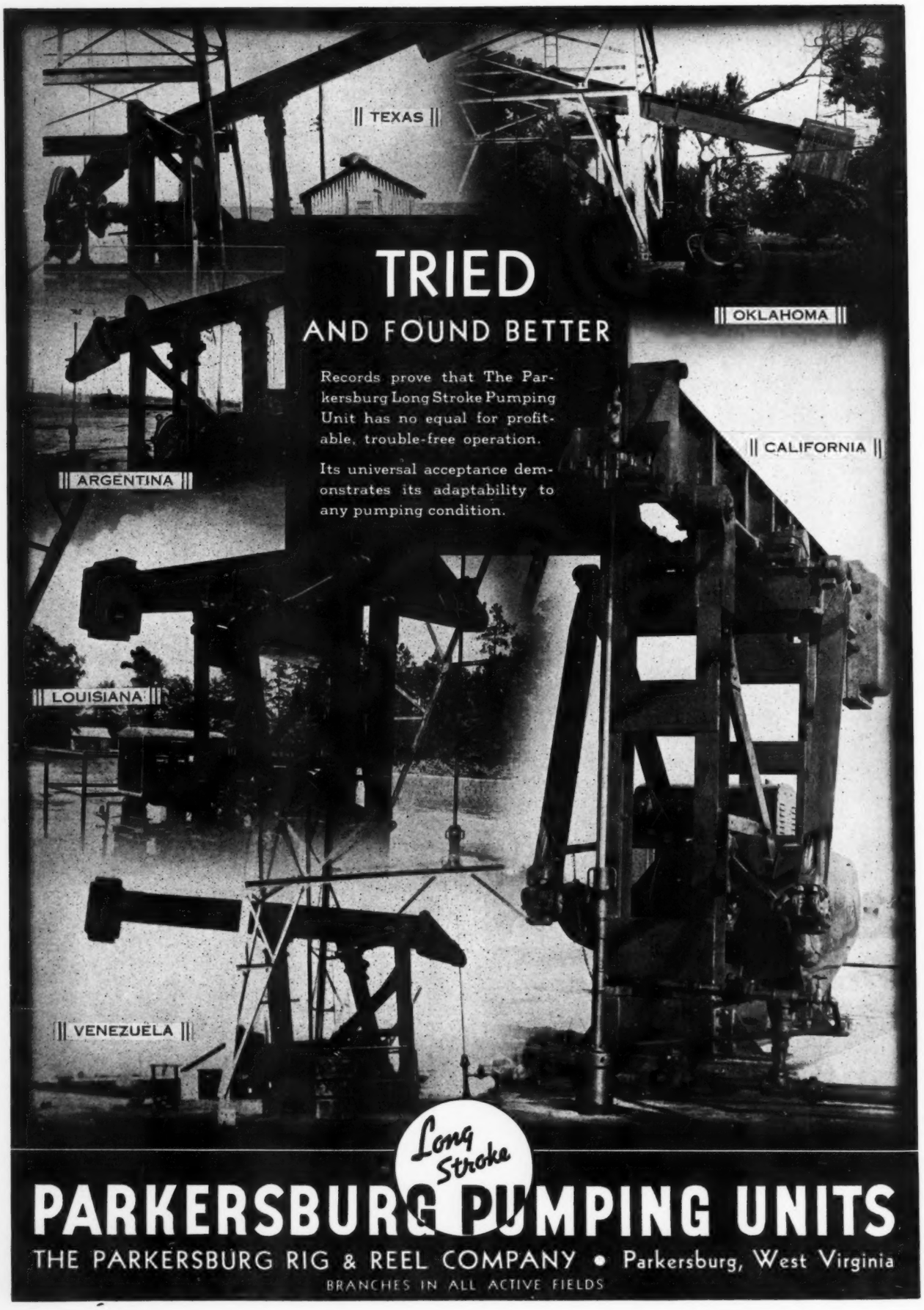
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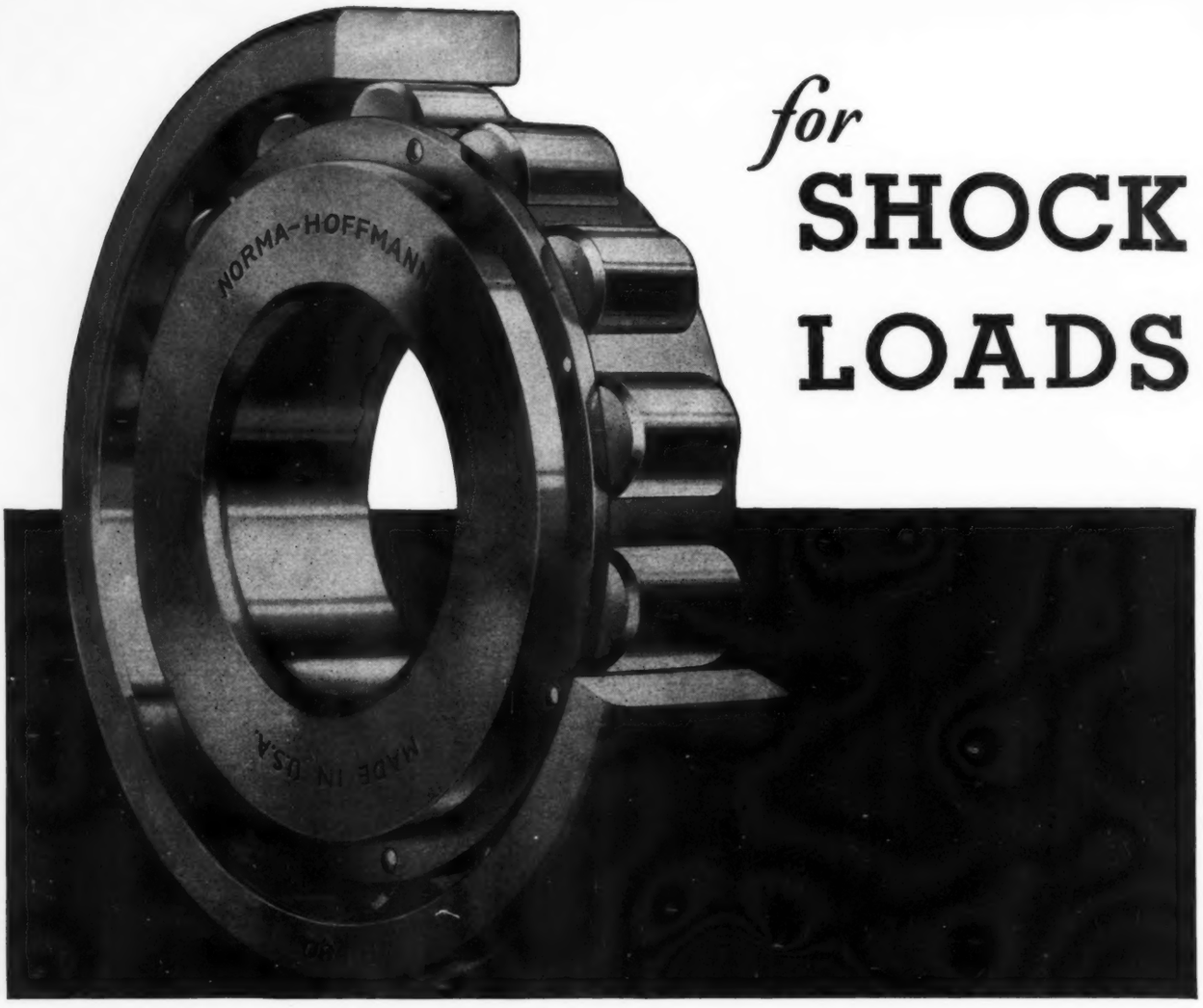
The INTERNATIONAL PETROLEUM Exposition

DIRECTORY OF
EXHIBITORS
* PAGE 77 *



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South Milwaukee, Wis.
No. 2 Texas Drive — Outside

BUFFALO GASOLENE MOTOR CO.
1280 Niagara Street, Buffalo, N. Y.
Booth Nos. 51-54-55 — California Building

BURDETT OXYGEN COMPANY
Tulsa, Okla.
Booth Nos. 1 and 2 — Texas Building

BUSSMAN MFG. COMPANY
St. Louis, Mo.
Booth No. 64 — California Building

BYRON JACKSON CO.
Berkeley and Los Angeles, Calif.
Booth Nos. 24-28 — Oklahoma Building

CAMERON IRON WORKS, INC.
711 Milby Street, Houston, Texas
No. 7 Pennsylvania Avenue — Outside

CARNEGIE-ILLINOIS STEEL CORP.
434 Fifth Avenue, Pittsburgh, Pa.
Booth Nos. 93 to 118 Incl. — Oklahoma Building

COLUMBIA STEEL COMPANY
Russ Building, 235 Montgomery Street, San Francisco, Calif.
Booth Nos. 93 to 118 Incl. — Oklahoma Building

CARSON MACHINE & SUPPLY CO.
1603 S. E. 29th Street, Oklahoma City, Okla.
Booth No. 46 — California Building

CATERPILLAR TRACTOR CO.
Peoria, Ill.
No. 10 Skelly Drive — Outside

THE CENTRAL FORGING CO.
Catawissa, Pa.
Booth No. 29 — Oklahoma Building

CHAIN BELT COMPANY
1600 West Bruce Street, Milwaukee, Wis.
Booth Nos. 70 and 71 — Texas Building

THE CHAMPION MACHINE AND FORGING COMPANY
3695 East 78th St., Cleveland, Ohio
Booth No. 13 — Continental Supply Building

THE CHAPLIN-FULTON MFG. CO.
38 Penn Ave., Pittsburgh, Pa.
Booth No. 40 — Scientific and Technical Bldg.

CHASE BRASS & COPPER CO.
236 Grand Street, Waterbury, Conn.
Booth Nos. 134 and 135 Texas Building

CHEVROLET MOTOR COMPANY
Detroit, Mich.
No. 5 Oklahoma Drive Outside

CHICAGO BRIDGE & IRON WORKS
37 West Van Buren St., Chicago, Ill.
Booth Nos. 86 and 125 Texas Building

CHIKSAN OIL TOOL CO., Ltd.
401 C. C. Chapman Building, Fullerton, Calif.
Booth Nos. 25-26 Refiners and Marketers Bldg.

CLARK BROS. CO.
Olean, New York
No. 3 Oklahoma Drive Outside

CLAYTON MARK & COMPANY
Chicago, Ill.
Booth No. 64 California Building

C. LEE COOK MANUFACTURING CO.
918 South Eighth St., Louisville, Ky.
Booth No. 51 Texas Building

THE CLEVELAND TRENCHER COMPANY
20100 St. Clair Ave., Cleveland, Ohio
No. 1 Oil City Way Outside

CLIMAX ENGINEERING COMPANY
Clinton, Iowa
Booth No. 6 Continental Supply Building

COCHRANE CORPORATION
Philadelphia, Pa.
Booth Nos. 8 and 9 Scientific and Tech. Bldg.

COFFING HOIST COMPANY
313-319 East Van Buren Street, Danville, Ill.
Booth No. 50 California Building

COLUMBIAN VISE & MFG. COMPANY
Cleveland, Ohio
Booth Nos. 1 and 2 Arcade

THE CONCRETE SURFACING MACHINERY CO.
4667-69 Spring Grove Ave., Cincinnati, Ohio
Booth No. 10 Arcade

THE CONTINENTAL SUPPLY COMPANY
Dallas, Texas
No. 2 Drake Drive Continental Building and Continental Outside Exhibits

FRED E. COOPER
Tulsa, Okla.
No. 15 Arcade Way Outside

THE COOPER-BESSEMER CORPORATION
Mt. Vernon, Ohio
No. 8 Skelly Drive Outside

COORS PORCELAIN CO.
Golden, Colo.
Booth Nos. 8-9 Scientific and Technical Bldg.

C-O-TWO FIRE EQUIPMENT CO.
Pyrene Bldg., 560 Belmont Ave. Newark, N. J.
Booth Nos. 38-39 Oklahoma Building

CORNING GLASS WORKS
Corning, N. Y.
Booth Nos. 8-9 Scientific and Technical Bldg.

CARRICK ENGINEERING CO.
Michigan City, Ind.
Booth Nos. 8-9 Scientific and Technical Bldg.

CRANE CO.
836 South Michigan Avenue, Chicago, Ill.
Booth Nos. 50, 51, 54 and 55 Ref. and Mark. Bldg

CROSBY STEAM GAGE AND VALVE CO.
Boston, Mass.
Booth Nos. 41-43 Scientific and Technical Bldg.

CROUSE-HINDS COMPANY
Syracuse, N. Y.
Booth Nos. 56 and 57 Oklahoma Building

CRUTCHER-ROLFS-CUMMINGS, Inc.
Houston, Texas
Booth Nos. 42-63 California Building

CUMMINS ENGINE CO.
Columbus, Ind.
Booth Nos. 43-47 Oklahoma Building

CYCLONE FENCE COMPANY
Waukegan, Ill.
Booths Nos. 93-118 Incl. Oklahoma Building

D. AND B. PUMP AND SUPPLY COMPANY
Los Angeles, Calif.—Dallas, Texas
Booth Nos.7 and 8 Continental Supply Bldg.

DARLING VALVE & MFG. CO.
Foot of Walnut St., Williamsport, Pa.
Booth Nos. 101 and 102 Oklahoma Building

DAVIS BORING TOOL COMPANY
6200 Maple Avenue, St. Louis, Mo.
Booth Nos. 80 and 81 Oklahoma Building

DAVIS REGULATOR COMPANY
Chicago, Ill.
Booth Nos. 41-43 Scientific and Technical Bldg.

THE DAYTON RUBBER MFG. CO.
Dayton, Ohio
Booth Nos. 14 and 15 California Building

DEARBORN CHEMICAL COMPANY
310 South Michigan Ave., Chicago, Ill.
Booth No. 105 Texas Building

JOHN DEERE TRACTOR CO.
Moline, Ill.
No. 10 Skelly Drive Outside

THE DEHYDRO CO.
No. 7 California Avenue Outside

DELTA MFG. COMPANY
Milwaukee, Wis.
Booth Nos. 1 and 2 Arcade

DIAMOND CHAIN & MFG. CO.
402 Kentucky Ave., Indianapolis, Indiana
Booth No. 31 Scientific and Technical Building

DODGE MANUFACTURING CORP.
Mishawaka, Ind.
Booth Nos. 4 and 5 California Building

DOWELL INCORPORATED
Kennedy Building, Tulsa, Okla.
Booth Nos. 28 and 29 California Building

DRIFTMETER, INC.
National Bank of Tulsa Bldg., Tulsa, Okla.
Booth No 108 Oklahoma Building

THE DUFF-NORTON MFG. COMPANY
Pittsburgh, Pa.
Booth No. 64 Oklahoma Building

E. I. du PONT de NEMOURS & CO.
936-37 Kennedy Bldg., Tulsa, Okla.
Booth No. 16 Arcade

DURAMETALLIC CORPORATION
2104 Factory St., Kalamazoo, Mich.
Booth No. 7 Texas Building

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901 Temple Bar Bldg., Cincinnati, Ohio
Booth Nos. 27-28 Scientific and Technical Bldg.

EASTMAN OIL WELL SURVEY CO. OF OKLAHOMA
5 Stiles Circle, Oklahoma City, Okla.
Booth Nos. 44 and 59 Scientific and Tech. Bldg.

ECONOMY ELECTRIC LANTERN CO., Inc.
329 West Huron, Chicago, Illinois
Booth No. 15 Texas Building

THE ELECTRIC MOTOR COMPANY
215-B East Archer, Tulsa, Okla.
Booth No. 46 Texas Building

ELECTRIC SUPPLY COMPANY
815 East Third Street, Tulsa, Okla.
Booth No 64 California Building

ELECTRO METALLURGICAL COMPANY
General Offices, New York
Booth No. 6 California Building

ELLIOTT COMPANY
Jeanette, Pa.
Booth No. 114 Oklahoma Building

EMSCO DERRICK AND EQUIPMENT COMPANY
Los Angeles, Calif.
Continental Outside Exhibits

THE ENGINEERING CO.
305 East Third St., Tulsa, Okla.
Booth Nos. 79 and 132 Texas Building

ENGINEERING LABORATORIES, Inc.
Kennedy Building, Tulsa, Okla.
Booth No. 11 Scientific and Technical Building

ENSIGN CARBURETOR CO., LTD.
7010 South Alameda St., Huntington Pk., Calif.
Booth No. 41 California Building

THE ERIE TOOL WORKS
Erie, Penna.
Booth No. 10 Scientific and Technical Building

EVERLASTING VALVE COMPANY
49 Fisk Street, Jersey City, N. J.
Booth Nos. 42-63 California Building

GEO. E. FAILING SUPPLY CO.
424 East Broadway, Enid, Okla.
No. 5 Oil City Way Outside

THE FAIRBANKS CO.
New York, N. Y.
Booth Nos. 25-27 Texas Building

FAIRBANKS, MORSE & COMPANY
Beloit, Wis.
No. 2 Drake Drive Continental Outside Exhibits

THE FALK CORPORATION
Milwaukee, Wis.
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FARRAR AND TREFTS, INCORPORATED
Buffalo, New York
No. 2 Drake Drive Continental Outside Exhibits

FISHER GOVERNOR COMPANY
Marshalltown, Iowa
Booth No. 89 Texas Building

GEO. J. FIX COMPANY
Dallas, Texas
Booth Nos. 9 and 10 Texas Building

STANLEY G. FLAGG & CO., INC.
1421 Chestnut Street, Philadelphia, Penna.
Booth No. 10 Scientific and Technical Building

FOOTE BROS. GEAR AND MACH. CORP.
5301 South Western Blvd., Chicago, Ill.
Booth No. 55 California Building

FOSTER WHEELER CORPORATION
New York, N. Y.
No. 3 Drake Drive Outside

FOUR WHEEL DRIVE AUTO CO.
Clintonville, Wis.
No. 5 Arcade Way Outside

FOXBORO COMPANY
Neponset Avenue, Foxboro, Mass.
Booth Nos. 4, 5, 6 Scientific and Techical Bldg.

FRANCE PACKING CO.
6512 Tacony St., Philadelphia, Pa.
Booth No. 86 Oklahoma Building

FRANKS MFG. COMPANY
P. O. Box 1174, Tulsa, Okla.
No. 3 Arcade Way Outside

FRICK-REID SUPPLY CO.
108 North Trenton Ave., Tulsa, Okla.
Booth No. 1 Drake Drive

GARDNER-DENVER COMPANY
Quincy, Illinois
No. 2 Drake Drive Continental Outside Exhibits

THE GARLOCK PACKING COMPANY
Palmyra, New York
Booth Nos. 59 and 60 Texas Building

GARRISON ENGINEERING CORPORATION
51 Church Street, Great Barrington, Mass.
Booth No. 56 California Building

ROBT. GAYLORD, INC.
2820 South Eleventh, St. Louis, Mo.
Booth No. 20 Oklahoma Building

GAS POWER, INCORPORATED
713 Esperson Building, Houston, Texas
Booth No. 27 California Building

GASO PUMP & BURNER MFG. CO.
First and Lansings Streets, Tulsa, Okla.
Booth Nos. 57 and 58 Texas Building

GATKE CORPORATION
228 N. La Salle St., Chicago, Ill.
Booth Nos. 23 and 24 California Building

GEARENCH MFG. COMPANY
317 Hughes Street, Houston, Texas
Booth Nos. 36 and 37 Texas Building

GENERAL ELECTRIC COMPANY
Schenectady, New York
No. 2 Drake Drive Continental Outside Exhibits

GENERAL PAINT CORPORATION
Sand Springs Road, Tulsa, Oklahoma
Booth Nos. 38 and 39 Texas Building

GODDARD & GODDARD, INC.
12280 Burt Road, Detroit, Mich.
Booth No. 2 Arcade

B. F. GOODRICH COMPANY
Akron, Ohio
Booth No. 43 Texas Building

GOODYEAR TIRE & RUBBER COMPANY
Akron, Ohio
Booth Nos. 45 and 60 California Building

GORMAN-RUPP PUMP CO.
Mansfield, Ohio
No. 12 Skelly Drive Outside

GRAY TOOL COMPANY
Houston, Texas
Booth Nos. 89, 90, 121, 122 Oklahoma Bldg.

GREENFIELD TAP & DIE CORP.
Greenfield, Mass.
No. 13 Skelly Drive Outside

A. P. GREEN FIRE BRICK CO.
533 Mayo Bldg., Tulsa, Okla.
Booth No. 56 Scientific and Technical Building

THE GUIBERSON CORPORATION
1000 Forest Avenue, Dallas, Texas
Booth Nos. 106 and 107 Texas Building

GUIBERSON DIESEL ENGINE COMPANY
1000 Forest Ave., Dallas, Texas
Booth Nos. 106 and 107 Texas Building

GULF PUBLISHING COMPANY
3301 Buffalo Drive, Houston, Texas
No. 5 Skelly Drive Outside

GUSTIN-BACON MANUFACTURING COMPANY
1412-18 West 12th Street, Kansas City, Mo.
Booth Nos. 60 and 45 California Building

HALLIBURTON OIL WELL CEMENTING COMPANY
1015 Bois D'Arc, Duncan, Okla.
No 5 Arcade Way

HANCOCK VALVE DIVISION CONSOLIDATED ASHCROFT HANCOCK COMPANY
Bridgeport, Conn.
Booth Nos. 8 and 9 Scientific and Tech. Bldg.

HANLON-WATERS, Inc.
National Bank of Tulsa Bldg., Tulsa, Okla
Booths Nos. 43-83-84-127-128 Texas Building

HAPPY BELTING COMPANY
310 East Tenth Street, Tulsa, Okla.
Booth Nos. 1 and 2 Oklahoma Building

HARNISCHFEGER SALES CORP.
Milwaukee, Wis.
No. 8 Seminole St. Outside

HART WELDING SUPPLY CO.
409-411 West California Ave., Okla. City, Okla.
Booth Nos. 91-120 Oklahoma Building

HAYES EQUIPMENT MFG. COMPANY
Gilbert and Santa Fe Streets, Wichita, Kan.
Booth No. 3 Refiners and Marketers Building

HAYNES STELLITE COMPANY
Kokomo, Ind
Booth Nos. 6-7-8-9 California Building

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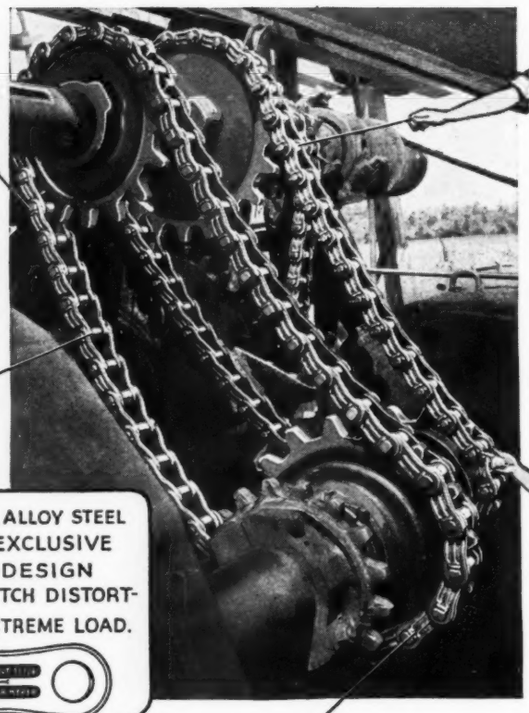

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Chain Number	Ultimate Strength, Pounds
SS-124, 3-Bar Hyper (API-4)	170,000
SS-124, 2-Bar Hyper (API-4)	130,000
SS-40 Hyper (API-3)	75,000
SS-40+ Red-Hed (API-3)	48,000
SS-124+ Red-Hed (API-4)	112,000
SS-40 (API-3)	28,000
SS-124 (API-4)	60,000

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So tough are the alloy steels of which it is made, so perfect is the finish, so precise is the fit of every Hyper part, that the complete chain resists evenly, throughout its whole assembly, the strains of severe service. 3-bar SS-124 Hyper illustrated (API-4) has an ultimate strength of 170,000 pounds.

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81 East Ross St., Wilkes-Barre, Pa.
Booth No. 28 Texas Building

HEMPHILL DIESEL SCHOOLS
Seattle Vancouver, B. C. New York Chicago Detroit Memphis Los Angeles
Booth No. 7 Scientific and Technical Building

HERCULES MOTORS CORPORATION
Canton, Ohio
Booth Nos. 76, 77, 78, 133, 134, 135 Oklahoma Building

HERCULES TOOL COMPANY
429 Kennedy Building, Tulsa, Okla.
Booth Nos. 55 and 56 Texas Building

HEWITT RUBBER CORP.
240 Kensington Ave., Buffalo, N. Y.
Booth Nos. 79 and 132 Texas Building

HILL, HUBBELL & COMPANY
Tulsa, Okla.
Booth Nos. 38 and 39 Texas Building

HILLS-McCANNA COMPANY
2349 Nelson Street, Chicago, Ill.
Booth No. 1 California Building

HINDERLITER TOOL COMPANY
1150 North Peoria, Tulsa, Okla.
Booth Nos. 22, 23, 24 Texas Building

HOMESTEAD VALVE MFG. CO.
Corapolis, Pa.
Booth Nos. 90 and 122 Texas Building

HOSE STAY-PUT TOOL COMPANY
Denver, Colo.
Booth No. 18 California Building

THE CHARLES N. HOUGH MFG. CO.
Main Office and Factory: Franklin, Pa.
Warehouse: 19 East Cameron St., Tulsa, Okla.
Booth Nos. 123 and 124 Texas Building

HOUSTON ENGINEERS, INC
Houston, Texas
Booth Nos. 42-63 California Building

HUGHES TOOL CO.
Hughes St., Houston, Texas
Booth Nos. 91-92-93 Texas Building

HYATT ROLLER BEARING COMPANY
P. O. Box 476, Newark, N. J.
Booth Nos. 108 and 109 Texas Building

HYDRIL CO. AND HYDRIL CO. OF TEXAS
714 West Olympic Blvd., Los Angeles, Calif.
4300 Calhoun Road, Houston, Texas
Booth No. 59 California Building

THE IDEAL ELECTRIC & MFG. CO.
Mansfield, Ohio
Booth No. 55 California Building

INGERSOLL-RAND COMPANY
11 Broadway, New York, N. Y.
No. 2 Tyler St. Outside

THE INTERNATIONAL DERRICK & EQUIPMENT CO.
875 Michigan Avenue, Columbus, Ohio
No. 10 Drake Drive Outside

INTERNATIONAL FILTER CO.
59 East Van Buren St., Chicago, Ill.
Booth No. 14 Scientific and Technical Building

INTERNATIONAL HARVESTER COMPANY
606 South Michigan Ave., Chicago, Ill.
No. 3 Arcade Way Outside

THE INTERNATIONAL NICKEL CO., Inc.
67 Wall Street, New York, N. Y.
Booth Nos. 64, 65 and 66 Texas Building and Ramp Location

INTERNATIONAL SUPPLY CO.
Tulsa, Okla.
No. 6 Beeville Lane Outside

INTERSTATE DROP FORGE COMPANY
Milwaukee, Wis.
Booth Nos. 70 and 71 Texas Building

INSLEY MFG. COMPANY
Indianapolis, Ind.
No. 12 Skelly Drive Outside

IVERSON TOOL CO.
216 West Second, Tulsa, Okla.
Booth No. 49 California Building

JARECKI MFG. CO.
Erie, Pa.
Booth Nos. 79-132 Texas Building

JENKINS BROS.
80 White St., New York, N. Y.
Booth Nos. 54-55 Refiners and Marketers Bldg.

JENSEN BROS. MFG. CO.
Coffeyville, Kans.
No. 5 Pennsylvania Avenue Outside

JOHNS-MANVILLE
22 E. 40th St., New York, N. Y.
Booth No. 87 Texas Building

THE JOHNSTON & JENNINGS CO. (OCECO DIVISION)
877 Addison Road, Cleveland, Ohio
Booth Nos. 82 and 129 Oklahoma Building

THE S. M. JONES COMPANY
715 McBirney Building, Tulsa, Okla.
Booth Nos. 18 and 19 Oklahoma Building

JONES & LAUGHLIN STEEL CORP.
Third Avenue and Ross Street, Pittsburgh, Pa.
Booth Nos. 12, 13, 14, 15 and 16 Oklahoma Building

THE JOYCE-CRIDLAND COMPANY
519 North Findlay St., Dayton, Ohio
Booth Nos. 49 and 50 Texas Building

KEROTEST MFG. CO.
Pittsburgh, Pa.
Booth Nos. 89-90-121-122 Oklahoma Building

KEY COMPANY
East St. Louis, Ill.
Booth Nos. 65-66 Refiners and Marketers Bldg.

KEYSTONE DRILLER COMPANY
2001 8th Ave., Beaver Falls, Pa.
No. 11 Oil City Way Outside

WALTER KIDDE & COMPANY, INC.
60 West St., Bloomfield, New Jersey
Booth No. 12 Arcade

KIMBLE GLASS COMPANY
Vineland, N. J.
Booth Nos. 8-9 Scientific and Technical Bldg.

M. M. KINLEY CO.
Houston, Texas
No. 5 Fitts Streets Outside

KOEHRING COMPANY
Milwaukee, Wis.
No. 12 Skelly Drive Outside

KUNKLE VALVE COMPANY
Fort Wayne, Ind.
Booth No. 10 Scientific and Technical Building

LACY COMPANY
Houston, Texas
Booth Nos. 42-63 California Building

LACY OIL TOOL CO.
973 N. Main St., Los Angeles, Calif.
No. 3 Skelly Drive Outside

LAGONDA MFG. CO. (TUBE CLEANER DEPT.)
Springfield, Ohio
Booth No. 111 Oklahoma Building

LANDIS MACHINE COMPANY, Inc.
5th and Church, Waynesboro, Pa.
Booth Nos. 6 and 7 Oklahoma Building

MAX E. LANDRY
Oklahoma City, Okla.
Booth Nos. 51-53-54-55 California Building

THE LANE-WELLS CO.
Los Angeles, Calif.
No. 7 Skelly Drive Outside

LARKIN PACKER COMPANY
6200 Maple Ave., St. Louis, Mo.
Booth Nos. 80 and 81 Oklahoma Building

LEE TIRE & RUBBER COMPANY
Conshohocken, Pa.
Booth No. 40 Refiners and Marketers Building

LEEDS & NORTHRUP COMPANY
4901 Stenton Avenue, Philadelphia, Pa.
Booth Nos. 29-30 Scientific and Technical Bldg.

LELAND EQUIPMENT COMPANY
515 West Archer Street, Tulsa, Okla.
Booth No. 12 Skelly Drive

A. LESCHEN & SONS ROPE CO.
5909 Kennerly Avenue, St. Louis, Mo.
Booth No. 118 Texas Building

LIBERTY MFG. COMPANY
Jeanette, Pa.
Booth No. 111 Oklahoma Building

LINCOLN ELECTRIC COMPANY
Cleveland, Ohio
Booth Nos. 67-69 Oklahoma Building

LINE SCALE COMPANY, INC.
Oklahoma City, Okla.
Booth No. 25 California Building

LINDE AIR PRODUCTS CO.
New York, N. Y.
Booth Nos. 6-7-8-9 California Building

LINEAR PACKING & RUBBER CO.
6400 State Road, Philadelphia, Pa.
No. 1 Drake Drive Outside

LINK-BELT COMPANY
Chicago, Ill.
Booths Nos. 61, 62, 63 Texas Building

THE LOUIS ALLIS CO.
427 E. Stewart Street, Milwaukee, Wis.
Booth No. 46 Texas Building

LUCEY BOILER & MFG. CORP.
1514 Chestnut St., Chattanooga, Tenn.
No. 9 Oil City Way Outside

LUCEY PRODUCTS CORP.
910 South Boston, Tulsa, Okla.
No. 8 Oil City Way Outside

LUFKIN FOUNDRY & MACHINE CO.
Lufkin, Texas
No. 15 Skelly Drive Outside

THE LUNKENHEIMER COMPANY
Cincinnati, Ohio
Booth Nos. 130 and 131 Oklahoma Building

MacCLATCHIE MFG. CO.
Compton, Calif.
No. 2 Drake Drive Outside
Booth No. 33 Texas Building

McCORD RADIATOR & MFG. CO.
2587 East Grand Ave., Detroit, Dich.
Booth Nos. 72 and 73 Oklahoma Building

McGREGOR ENGINEERING COMPANY
208 Midco Building, Tulsa, Okla.
Booth No. 24 Oklahoma Building

ARTHUR G. McKEE & COMPANY
Cleveland, Ohio
Booth No. 7 Scientific and Technical Building

MACHINE TOOL & SUPPLY CO.
215-217 East Second, Tulsa, Okla.
Booth Nos. 1, 2 and 7 Arcade

MACWHYTE COMPANY
2916 14th Ave. Kenosha, Wis.
Booth No. 38 California Building

MALONEY TANK MFG. COMPANY
38 North Peoria, Tulsa, Okla.
Booth No. 14 Refiners and Marketers Building
And No. 21 Oklahoma Drive

THE MANHATTAN RUBBER MFG. DIV.
Passaic, N. J.
No. 5 Drake Drive National Supply Co. Bldg.

MANZEL BROTHERS COMPANY
309-319 Babcock Street, Buffalo, New York
Booth No. 50 Oklahoma Building

MARATHON OIL COMPANY
Thompson Building, Tulsa, Oklahoma
Booth Nos. 33-34 Refiners and Marketers Bldg.

MARMON-HERRINGTON SALES, Inc.
Ponca City, Okla.
No. 7 Oil City Way Outside

MARTIN-DECKER CORP.
Long Beach, Calif.
Booth No. 12 Texas Building

MASON-NEILAN REGULATOR CO.
Boston, Mass.
Booth Nos. 14 and 15 Arcade

C. A. MATHEY MACHINE WORKS
305 East Third St., Tulsa, Okla.
Booth No. 16 Arcade

M. & H. VALVE & FITTINGS COMPANY
Anniston, Alabama
Booth No. 10 Scientific and Technical Building

THE MECHANICAL RUBBER COMPANY
Passaic, N. J.
Booth No. 11 Continental Supply Building

MERCO CENTRIFUGAL CO.
343 Sansome Street, San Francisco, Calif.
Booth Nos. 42-63 California Building

MERCO NORDSTROM VALVE CO.
Tulsa, Okla.
400 North Lexington Avenue, Pittsburgh, Pa.
Booth Nos. 37-38 Scientific and Technical Bldg.

THE MERIAM COMPANY
Cleveland, Ohio
Booth Nos. 41-43 Scientific and Technical Bldg.

METALS COATING COMPANY OF AMERICA
Philadelphia, Pa.
Booth Nos. 31-33 Oklahoma Building

METRIC METAL WORKS
Erie, Pa.
Booth Nos. 41-43 Scientific and Technical Bldg.

MID-CONTINENT PETROLEUM CORP.
Tulsa, Okla.
Booth Nos. 19-20 Refiners and Marketers Bldg.

MID-CONTINENT PUMP SUPPLY CO.
915 East Second St., Tulsa, Okla.
Booth Nos. 25, 26 and 27 Texas Building

MID-CONTINENT SUPPLY COMPANY
Mid-Continent Building, Fort Worth, Texas
Booth Nos. 43, 44, 45, 46 and 47 Oklahoma Bldg.

MIDWEST EQUITABLE METER CO.
Box 1807, Tulsa, Okla.
Booth Nos. 37-38 Scientific and Technical Bldg.

MIDWEST PIPING & SUPPLY CO., Inc.
1450 South Second St., St. Louis, Mo.
No 1 Drake Drive Outside

MILLER SAND PUMP CO.
Box 4516, Oklahoma City, Okla.
Booth No. 10 Oil City Way

THE MINNEAPOLIS-HONEYWELL REGULATOR CO.
Minneapolis, Minn.
Booth Nos. 39 and 64 Scientific and Tech. Bldg.

MINE SAFETY APPLIANCES COMPANY
Braddock, Thomas and Meade Streets, Pittsburgh, Pa.
Booth Nos. 48 and 49 Oklahoma Building

MISSION MANUFACTURING CO.
P. O. Box 1249, Houston, Texas
Booth Nos. 119 and 120 Texas Building

MO-ARK OXYGEN CO.
Ft. Smith, Ark.
Booth Nos. 36 and 37 Oklahoma Building

LEE C. MOORE & CO.
Tulsa, Okla.
Booth Nos. 65 and 66 Oklahoma Building

MOORLANE COMPANY
409 East Archer, Tulsa, Okla.
Booth No. 83 Oklahoma Building

MORRISON BROS.
Dubuque, Iowa
Booth No. 5 Refiners and Marketers Building

MORSE CHAIN COMPANY
Ithaca, N. Y.
Booth No. 54 California Building

MOTOR IMPROVEMENTS, Inc.
365 Frelinghuysen Avenue, Newark, N. J.
Booth No. 17 Oklahoma Building

MURRAY TOOL & SUPPLY CO.
Tulsa, Okla.
Booth No. 59 California Building

MUSKOGEE IRON WORKS, Inc.
Muskogee, Okla.
Booth No. 9 Skelly Drive

NATIONAL CARBIDE SALES CORPORATION
Lincoln Bldg., 60 E. 42nd St., New York City
Booth No. 30 Oklahoma Building

NATIONAL CARBON COMPANY
Kansas City, Mo.
Booth No. 64 California Building

NATIONAL LEAD COMPANY
722 Chestnut Street, St. Louis, Mo.
Booth No. 46 Scientific and Technical Building

NATIONAL RADIATOR CORPORATION
221 Central Ave., Johnstown, Penna.
Booth Nos. 12 and 13 California Building

THE NATIONAL SUPPLY COMPANIES
Toledo, Ohio
Booth No. 5 Drake Drive

NATIONAL TANK COMPANY
Tulsa, Okla.
Booth Nos. 96-115 Texas Building
No. 9 Oil City Way Outside

NATIONAL TRANSIT PUMP & MACHINE CO.
206 Seneca St., Oil City, Pa.
No. 1 Drake Drive Outside

NATIONAL TUBE COMPANY
Frick Building, Pittsburgh, Pa.
Booth Nos.93 to 118 Incl. Oklahoma Building

NEW BEDFORD CORDAGE COMPANY
New Bedford, Mass.
Booth No. 12 Continental Supply Building

NEW DEAL SPECIALTY COMPANY, INC.
Okmulgee, Okla.
No. 11 Oklahoma Drive Outside

NEW ORLEANS CORRUGATED BOX CO.
New Orleans, La.
Booth No. 20 Oklahoma Building

NORMA-HOFFMAN BEARINGS CORP.
Stamford, Conn.
Booth No. 8 Texas Building

W. C. NORRIS MANUFACTURER, INC.
10 North Elwood, Tulsa, Okla.
Booth Nos. 8 and 11 Arcade, Arcade Way

NORVELL-WILDER SUPPLY COMPANY
Houston, Texas
No. 3 Skelly Drive Outside

NOVO ENGINE COMPANY
Lansing, Mich.
No. 5 Drake Drive National Supply Co. Bldg.

WM. W. NUGENT & CO.
410-412 North Hermitage Avenue, Chicago, Ill.
Booth No. 88 Texas Building

OAKITE PRODUCTS, Inc.
22 Thames St., New York, N. Y.
Booth Nos. 10 and 11 California Building

WALTER O'BANNON COMPANY
400 South Rockford, Tulsa, Okla.
Booth No. 104 Texas Building

THE O. C. S. MFG. CO.
Coffeyville, Kan. Long Beach, Calif.
Booth Nos. 10 and 11 Oklahoma Building
No. 1 Skelly Drive Outside

THE OHIO OIL CO.
Findlay, Ohio
Booth Nos. 33 and 34
Refiners and Marketers Building

THE OHIO STEEL FOUNDRY COMPANY
Springfield, Ohio
Booth Nos. 76 and 77 Texas Building

THE OIL CONSERVATION ENG'G. CO
Cleveland, Ohio
Booth Nos. 82-129 Oklahoma Building

OIL WELL IMPROVEMENTS CO.
P. O. Box 699, Tulsa, Okla.
Booth Nos. 94, 95 and 116 Texas Building

OIL WELL SUPPLY COMPANY
Dallas, Texas
No. 3 Drake Drive Outside

OKLAHOMA IRON WORKS
Tulsa, Okla.
No. 6 Beeville Lane Outside

OKLAHOMA STEEL CASTINGS CO.
1200 North Peoria Ave., Tulsa, Okla.
Booth Nos. 47 and 48 Texas Building

THE OSBORN MFG. CO.
5401 Hamilton Avenue, Cleveland, Ohio
Booth No. 5 Arcade

THE OSTER MANUFACTURING CO.
2057 East 61st Place, Cleveland, Ohio
Booth Nos. 59, 60, 61, 62 and 63
Oklahoma Building

OTIS PRESSURE CONTROL CO.
Tower Petroleum Bldg., Dallas, Texas
Booth No. 35 Oklahoma Building

OWEN-ILLINOIS GLASS CO.
Newark, Ohio
Booth No. 63 Scientific and Technical Building

PACIFIC PUMP WORKS
Huntington Park, Calif.
Booth Nos. 25, 26 and 27 Texas Building

THE PARASOL COMPANY
Tulsa, Okla.
No. 7 California Avenue Outside

THE PARKERSBURG RIG & REEL COMPANY
620 Depot Street, Parkersburg, W. Va.
Booth Nos. 74 and 75 Texas Building
No. 12 Drake Drive Outside

PETROLEUM ELECTRIC POWER CLUB
Oklahoma City, Oklahoma
Mid-Continent Oil Fields
Booth Nos. 35 and 36
Refiners and Marketers Building

THE PETROLEUM ENGINEER
406 Tower Petroleum Building, Dallas, Texas
Booth Nos. 34 and 35 Texas Building

PHILLIPS PETROLEUM CO.
Bartlesville, Okla.
Booth No. 40 Refiners and Marketers Building

PHISTER MFG. CO.
621 Pearl St., Cincinnati, Ohio
Booth No. 2 California Building

PITTSBURGH EQUITABLE METER CO.
Box 1807, Tulsa, Okla.
No. 6 Arcade Way Outside

PITTSBURGH STEEL COMPANY
Union Trust Bldg., Pittsburgh, Pa.
Booth Nos. 4, 5, 6 Texas Building

PITTSBURGH VALVE & FITTINGS CORP.
Barberton, Ohio — Houston, Texas
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PLIBRICO JOINTLESS FIREBRICK CO.
1800 Kingsbury St., Chicago, Ill.
Booth No. 4 Refiners and Marketers Building

PLYMOUTH CORDAGE COMPANY
North Plymouth, Mass.
No. 3 Drake Drive Outside

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No. 3 West Va. Ave. Outside

THE WM. POWELL COMPANY
2525 Spring Grove Ave., Cincinnati, Ohio
Booth Nos. 45 and 58
Scientific and Technical Building

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Booth No. 11 Texas Building

PYRENE MANUFACTURING COMPANY
560 Belmont Avenue, Newark, New Jersey
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QUAKER CITY RUBBER COMPANY
Chicago, Ill.
No. 12 Skelly Drive Outside

QUIGLEY COMPANY, INC.
56 West 45th St., New York, N. Y.
Booth Nos. 61 and 62 Ref. and Marketers Bldg.

J. P. RATIGAN
1213 Santa Fe Ave., Los Angeles, Calif.
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RAYBESTOS DIVISION OF RAYBESTOS-MANHATTAN, INC.
Railroad Ave., Bridgeport, Conn.
No. 1 Drake Drive Outside

READING-PRATT & CADY COMPANY, Inc.
929 Connecticut Ave., Bridgeport, Conn.
Booth No. 85 Oklahoma Building

RECTOR WELL EQUIPMENT CO., Inc.
1603 Fort Worth National Bank Building, Fort Worth, Texas
Booth No. 21 Oklahoma Building

REDA PUMP COMPANY
Bartlesville, Okla.
No. 5 Seminole St. Outside

REED ROLLER BIT COMPANY
Houston, Texas
Booth Nos. 12, 13 and 14 Texas Building

THE REFINERY SUPPLY COMPANY
621 East Fourth Street, Tulsa, Okla.
Booth Nos. 8 and 9
Scientific and Technical Building

JOSEPH REID GAS ENGINE CO.
Main and Klein Streets, Oil City, Pa.
No. 1 Drake Drive Outside

RELIANCE REGULATOR CORPORATION
Alhambra, Calif.
Booth Nos. 41-43
Scientific and Technical Building

REPUBLIC RUBBER COMPANY
Youngstown, Ohio
Booth Nos. 25, 26 and 27 Texas Building
And No. 1 Drake Drive

REPUBLIC STEEL CORP.
Republic Bldg., Cleveland, Ohio
Booth Nos. 16, 17, 18, 19, 20, 21 Texas Building

RIDGE TOOL COMPANY
Box 670, Elyria, Ohio
Booth Nos. 29 and 30 Texas Building

RILEY OIL CO.
624 South Cheyenne Ave., Tulsa, Okla.
Booth No. 16 Refiners and Marketers Building

ROBINSON ORIFICE FITTING CO.
Los Angles, Calif.
Booth Nos. 41-43
Scientific and Technical Building

ROBINSON PACKER COMPANY
210 North Main St., Tulsa, Okla.
Booth No. 5 Oklahoma Building

JOHN A. ROEBLING'S SONS CO.
Trenton, N. J.
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11th and Pearl Sts., Joplin, Mo.
Booth No. 13 Refiners and Marketers Building

ROMORT MANUFACTURING COMPANY
Main Street, Oakfield, Wisconsin
Booth No. 13 Arcade

ROYALL FIRE BRICK & SUPPLY CO.
Tulsa, Okla.
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RUEMELIN MANUFACTURING CO.
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Booth No. 74 Oklahoma Building

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A. W. SCHULLER, INC.
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Booth No. 41 California Building

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SCOVILL MANUFACTURING COMPANY
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Booth No. 127 Oklahoma Building

SCULLY STEEL PRODUCTS COMPANY
1319 Wabansia Avenue, Chicago, Ill.
Booth Nos. 93 and 118 Inclusive
Oklahoma Building

SEALED POWER CORP.
Muskegon, Mich.
Booth No. 21 Refiners and Marketers Building

SEISMOGRAPH SERVICE CORPORATION
Kennedy Building, Tulsa, Okla.
Booth No. 11 Scientific and Technical Building

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Tulsa, Okla.
No. 2 West Virginia Avenue Outside

THE SHAFFER SPECIALTY CO.
2440 E. King St., Box 136, Whittier Station, Tulsa, Okla.
No. 7 Oklahoma Drive Outside

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Booth Nos. 99, 100, 111 and 112 Texas Building

SKELLY OIL COMPANY
4th and Boulder, Tulsa, Okla.
Booth Nos. 46, 47, 58 and 59
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S K F INDUSTRIES, INC.
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New York, N. Y.
No. 4 Skelly Drive Outside

A. O. SMITH CORPORATION
P. O. Box 584, Milwaukee, Wisconsin
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SMITH SEPARATOR CORPORATION
624 South Cheyenne, Tulsa, Okla.
Booth Nos. 90, 121 and 122 Texas Building

SOLDNER OF SALINA
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No. 15 Oklahoma Drive Outside

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SPANG AND COMPANY
Etna Street, Butler, Pa.
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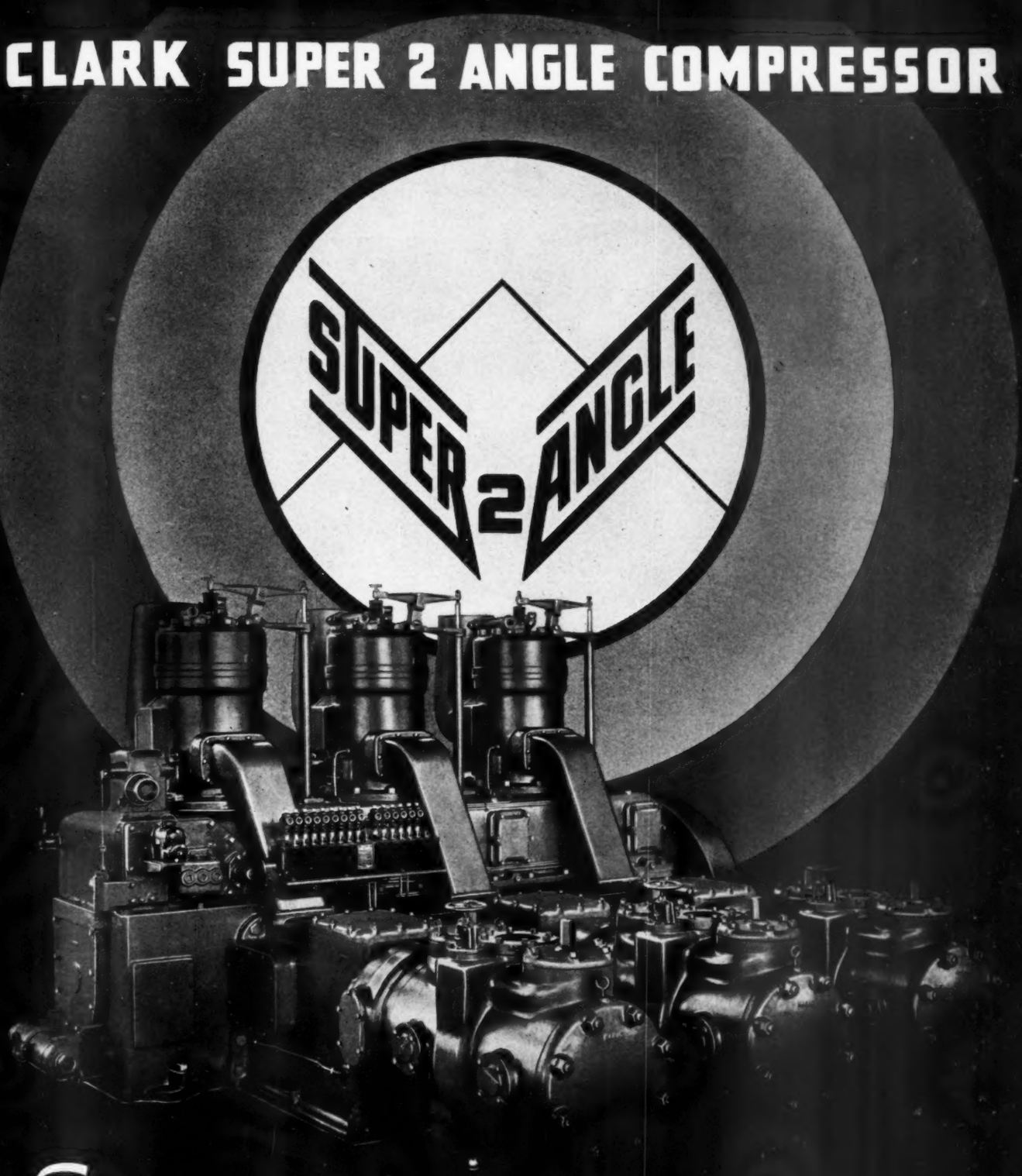
CLARK SUPER 2 ANGLE COMPRESSOR



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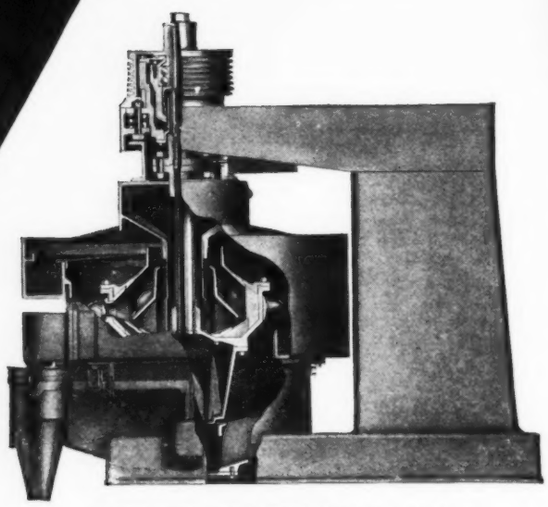

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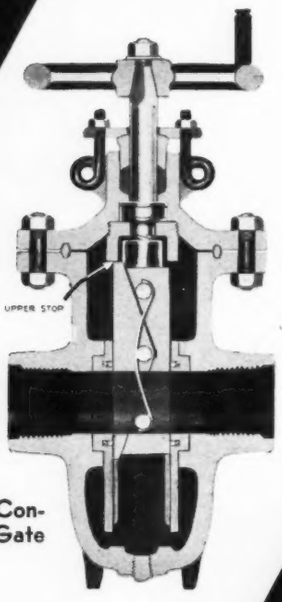

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Kansas City, Mo.
No. 12 Skelly Drive — Outside

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8 East 10th Street, Tulsa, Okla.
Booth No. 32 — Texas Building

STOODY COMPANY
Whittier, Calif.
Booth Nos. 31-33 — Oklahoma Building

STOVER MANUFACTURING & ENGINE CO.
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TEMPLETON KENLY CO.
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Hartford, Conn.
No. 4 Skelly Drive — Outside

THE TEXAS COMPANY
Houston, Texas
Booth Nos. 31-32 — Refiners and Marketers Bldg.

THERMOID RUBBER COMPANY
Trenton, N. J.
No. 3 Drake Drive — Outside

THOMPSON PUMP CO.
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Booth No. 48 — California Building

THORNHILL-CRAVER CO., INC.
3016 Polk Ave., Houston, Texas
Booth No. 52 — California Building

THE TIMKEN ROLLER BEARING CO.
1835 Dueber Ave., S. W., Canton, Ohio
Booth Nos. 72 and 73 — Texas Building

THE TIMKEN STEEL & TUBE COMPANY
1835 Dueber Avenue, S. W., Canton, Ohio
Booth Nos. 10, 11 and 12
Refiners and Marketers Building

TITUSVILLE IRON WORKS
Titusville, Pa.
No.6 Beeville Lane — Outside

TNEMEC CO., INC.
3122 Roanoke Road, Kansas City, Mo.
No. 7 Arcade Way — Outside

THE TOKHEIM COMPANY
Cedar Rapids, Iowa
Booth No. 44 Refiners and Marketers Building

THE TOLEDO PIPE THREADING MACHINE CO.
1445 Summit Street, Toledo, Ohio
Booth Nos. 30 and 31 — California Building

TRACKSON COMPANY
Milwaukee, Wisconsin
No. 8 Tyler Street — Outside

TRIMONT MFG. CO., INC.
57 Amory St., Roxbury (Boston) Mass.
Booth No. 100 — Oklahoma Building

TRUSCON STEEL COMPANY
Youngstown, Ohio
Booth Nos. 16-21 — Texas Building

TULSA BOILER & MACHINERY CO.
West Tulsa, Okla.
No. 3 California Avenue — Outside

TULSA CANVAS PRODUCTS COMPANY
1217 E. Fourth St., Tulsa, Okla.
Booth No. 17 Refiners and Marketers Building

TWIN DISC CLUTCH CO.
Racine, Wis.
Booth Nos. 79-132 — Oklahoma Building

TYSON ROLLER BEARING CORPORATION
Massillon, Ohio
Booth No. 26 — California Building

UNAWELD MFG. CO. OF TEXAS
1503 Gentry Street, Houston, Texas
Booth No. 22 — California Building

UNION CARBIDE & CARBON COMPANY
204 E. 42nd St., New York, N. Y.
Booth Nos. 6, 7, 8 and 9 — California Building

UNION CHAIN & MFG. CO.
Sandusky, Ohio
Booth Nos. 4 and 5 — California Building

UNION DRAWN STEEL COMPANY
Massillon, Ohio
Booth Nos. 16-21 — Texas Building

UNION WIRE ROPE CORPORATION
21st and Manchester Ave., Kansas City, Mo.
Booth Nos. 80, 81, 82, 129, 130, 131
Texas Building

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Booth Nos. 20 and 21 — California Building

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Booth No. 84 — Texas Building

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Tulsa, Okla.
Booth No. 133 — Texas Building

HENRY VOGT MACHINE COMPANY
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Booth No. 128 — Oklahoma Building

VORTOX MANUFACTURING COMPANY
Claremont, Calif.
Booth No. 75 — Oklahoma Building

WAGNER ELECTRIC CORPORATION
St. Louis, Missouri
Booth No. 55 — Oklahoma Building

W. L. WALKER CO.
Tulsa, Okla.
Booth Nos. 56 and 57 — California Building
Booth No. 12 — Arcade

WALL ROPE WORKS, INC.
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Booth No. 31 — Texas Building

WALTON, VIKING CO.
Kansas City, Mo.
Booth No. 12 — Arcade

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Booth Nos. 104, 105, 106 and 107
Oklahoma Building

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Waukesha, Wisc.
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WEBER ENGINE CO.
Kansas City, Mo.
No. 7 Arcade Way — Outside

THE WEBSTER ENGINEERING COMPANY
419 West 2nd St., Tulsa, Okla.
Booth Nos. 22 and 23 — Oklahoma Building

WELDERS SUPPLY COMPANY
311 East Third St., Tulsa, Okla.
Booth Nos. 1 and 2 — Texas Building

WELL MACHINERY & SUPPLY CO., Inc.
Fort Worth, Texas
No. 5 California Avenue — Outside

WESTCOTT AND GRIES, Inc.
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Booth Nos. 41, 42 and 43
Scientific and Technical Building

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Booth No. 17 — California Building

WESTERN METAL MFG. COMPANY
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No. 7 Arcade Way — Outside

THE WHELAND CO.
Chattanooga, Tenn.
No. 8 Oil City Way — Outside

THE WHITE MOTOR COMPANY
Cleveland, Ohio
No. 6 Oklahoma City Avenue — Outside

WHITLOCK CORDAGE CO.
46 South Street, New York, New York
No. 1 Drake Drive — Outside

WICKWIRE SPENCER STEEL COMPANY
41 East 42nd Street, New York, N. Y.
Booth Nos. 109 and 110 — Oklahoma Building

WICO ELECTRIC COMPANY
Springfield, Mass.
Booth No. 110 — Texas Building

JOHN H. WIGGINS
Tulsa, Okla.
Booth Nos. 86-125 — Texas Building

WILLAMETTE-HYSTER COMPANY
Portland, Oregon
No. 10 Skelly Drive — Outside

WILLARD STORAGE BATTERY CO.
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Booth No. 34 — California Building

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Booth No. 10 Scientific and Technical Building

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R. C. WILLIAMS & CO.
Wayne, Ohio
Booth Nos. 123-124 — Texas Building

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6532 South Menard Ave., Chicago, Ill.
Booth No. 39 Refiners and Marketers Building

WILSON MANUFACTURING COMPANY
P. O. Box 329, Wichita Falls, Texas
No. 8 Oklahoma City Avenue — Outside

WILSON WELDER AND METALS CO.
936-70 38th Street, North Bergen, New Jersey
Booth No. 34 — Oklahoma Building

W-K-M COMPANY, Inc.
Houston, Texas
Booth Nos. 61, 62, 63, 42, 43, 44
California Building

WOOBANK PUMP & MACHINERY CO.
215-B East Archer Street, Tulsa, Okla.
Booth No. 51 — Texas Building

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Booth No. 1 — Arcade

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Youngstown, Ohio
Booth Nos. 1, 2, 3 and 4 Continental Building

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Chicago, Ill.
Booth No. 4 — Continental Supply Building

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FORGE AND
PIPE WORKS
Booth 84
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BOVAIRD
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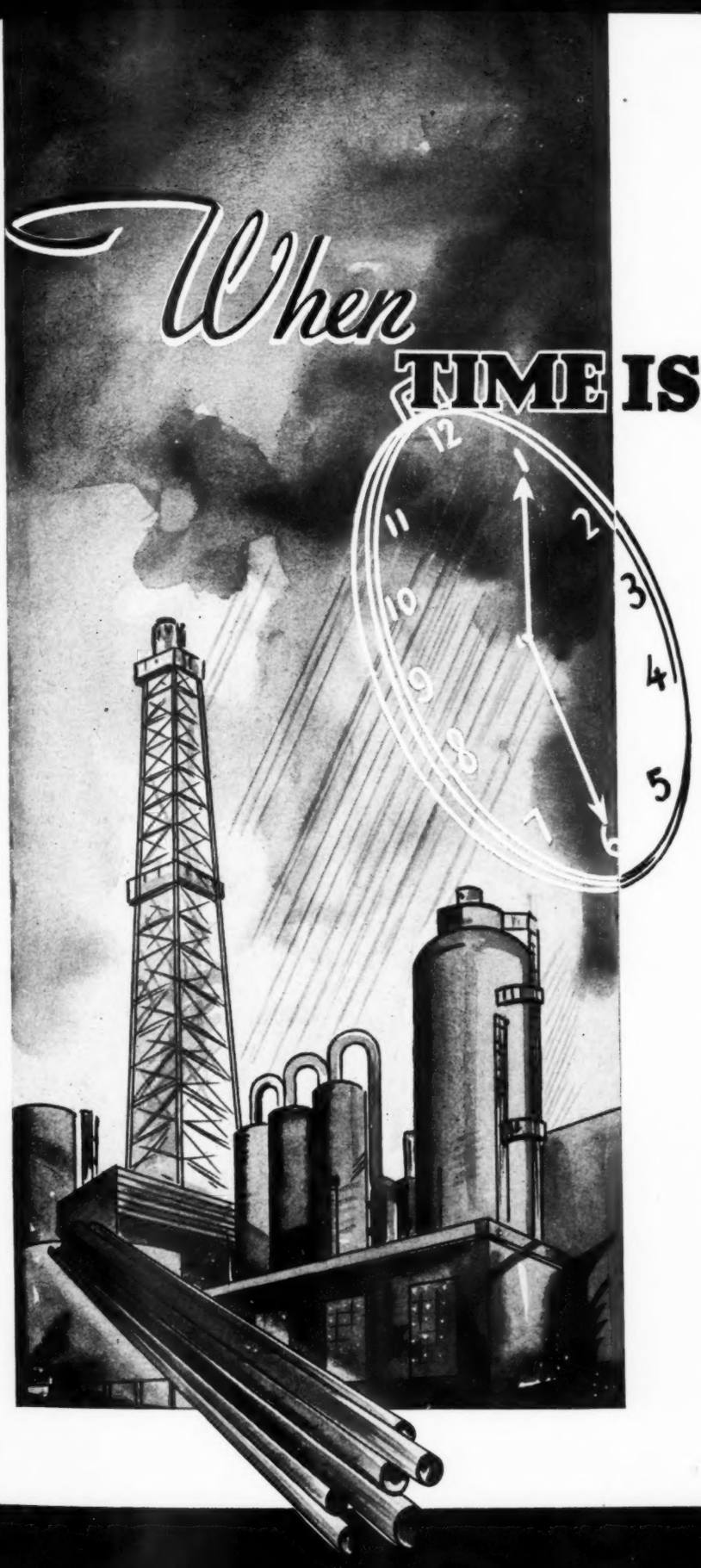
and
THE FAIRBANKS CO.
HAZARD WIRE ROPE
THE REPUBLIC
RUBBER CO.
PACIFIC PUMP WORKS
& MID-CONTINENT
PUMP AND SUPPLY
Booth 26-27
TEXAS BUILDING

BYRON JACKSON CO.
BJ
BOOTH 24-28
OKLAHOMA BUILDING
CHAIN BELT CO. BOOTH 70-71
TEXAS BLDG.
The
VERNON TOOL CO.
BOOTH
BARCO
UNIVERSAL
ENGINEERING CO.
Ltd.
BOOTH 117
TEXAS BLDG

JONES-LAUGHLIN STEEL CORP.
BOOTH 12-16
OKLAHOMA BUILDING
MID CONTINENT SUPPLY CO.
BOOTH 43-47
OKLAHOMA BLDG.
OAKITE PRODUCTS, INC.
BOOTH 10-11
CALIFORNIA BLDG.



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John DEERE TRACTOR COMPANY No 10. Skelly DRIVE
JOHN DEERE
For Oil Field Service

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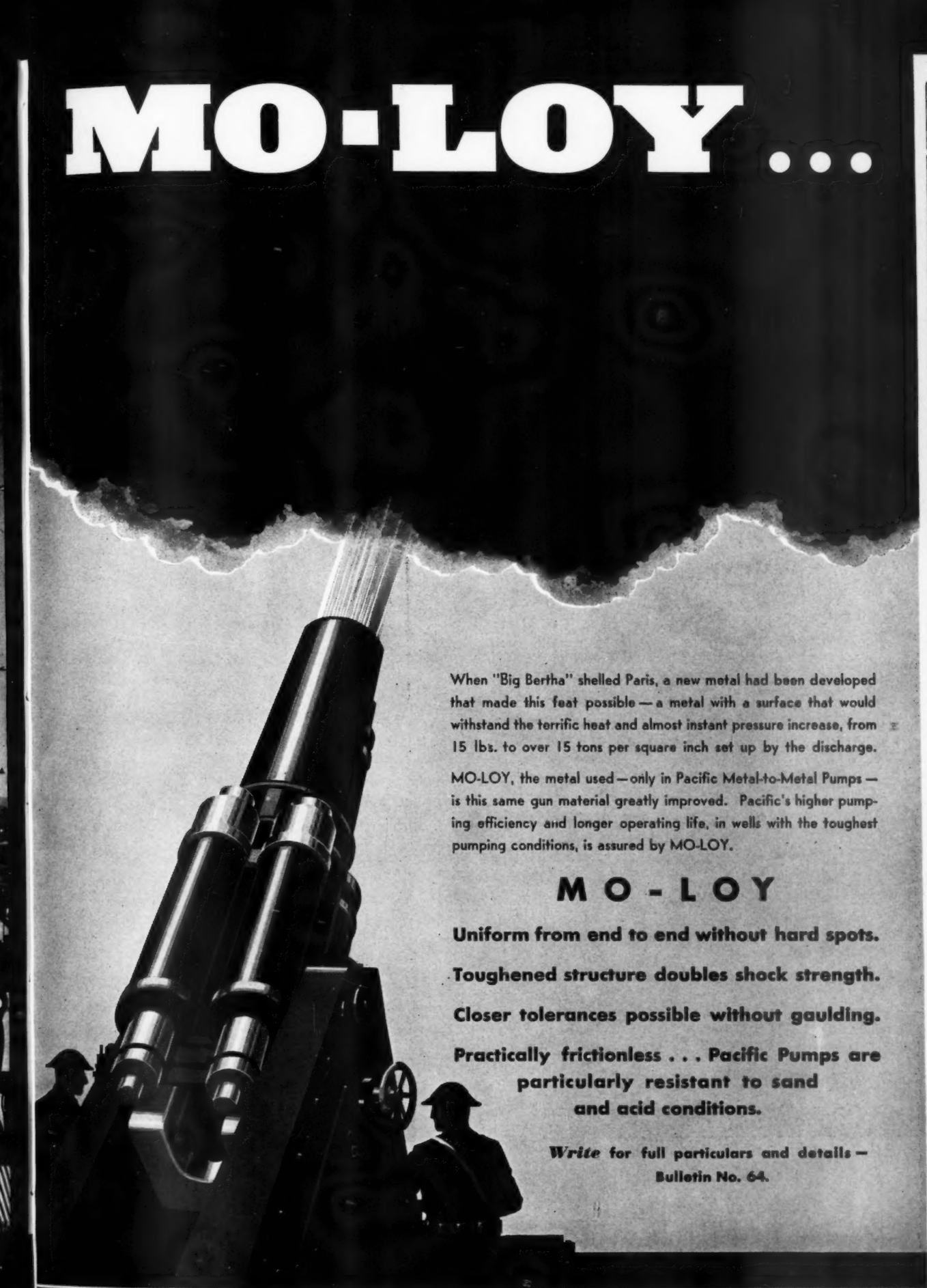

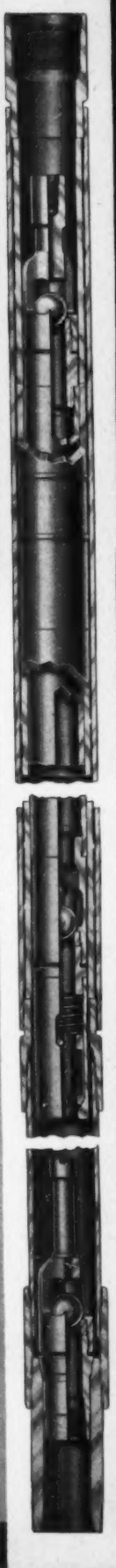

When "Big Bertha" shelled Paris, a new metal had been developed that made this feat possible — a metal with a surface that would withstand the terrific heat and almost instant pressure increase, from 15 lbs. to over 15 tons per square inch set up by the discharge.

MO-LOY, the metal used — only in Pacific Metal-to-Metal Pumps — is this same gun material greatly improved. Pacific's higher pumping efficiency and longer operating life, in wells with the toughest pumping conditions, is assured by MO-LOY.

MO-LOY

Uniform from end to end without hard spots.

Toughened structure doubles shock strength.

Closer tolerances possible without gaulding.

Practically frictionless . . . Pacific Pumps are particularly resistant to sand and acid conditions.

Write **for full particulars and details — Bulletin No. 64.**

PACIFIC PUMP WORKS . . . HUNTINGTON PARK, CALIF.

FACTORY BRANCH:

MID-CONTINENT PUMP SUPPLY COMPANY

TULSA, OKLAHOMA

DISTRIBUTORS: The Bovaird Supply Co., Kansas and Texas Panhandle — Production Supply Co., Oklahoma City, Okla. — Mid-Continent Supply Co., Texas and Louisiana

SHOWS HAVE CHANGED!

The old side-show barker and the medicine fakir played to a credulous and willing audience. Their stock in trade was blatant bally-hoo.

Contrast that with the scientific intent of the International Petroleum Exposition at Tulsa May 16-23, and with the dignity and integrity of the Frick-Reid building and exhibit aimed primarily to interest the successful, the critical, the skeptical veterans of every branch of the oil industry!

Not that the Tulsa Show won't have its festive atmosphere—a time and place for renewing old friendships and making new contacts. And may the Frick-Reid building be headquarters for your conception of a thoroughly successful Exposition. We're waiting to say "Howdy!"

The Frick-Reid Store in your field is the mouth of the funnel into which the world's foremost manufacturers pour the cream of their products.

FRICK-REID SUPPLY CORPORATION

PITTSBURGH, PA.....TULSA, OKLA..... *Stores Everywhere*

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FRICK-REID SUPPLY CO.
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JOSEPH REID GAS ENGINE CO.
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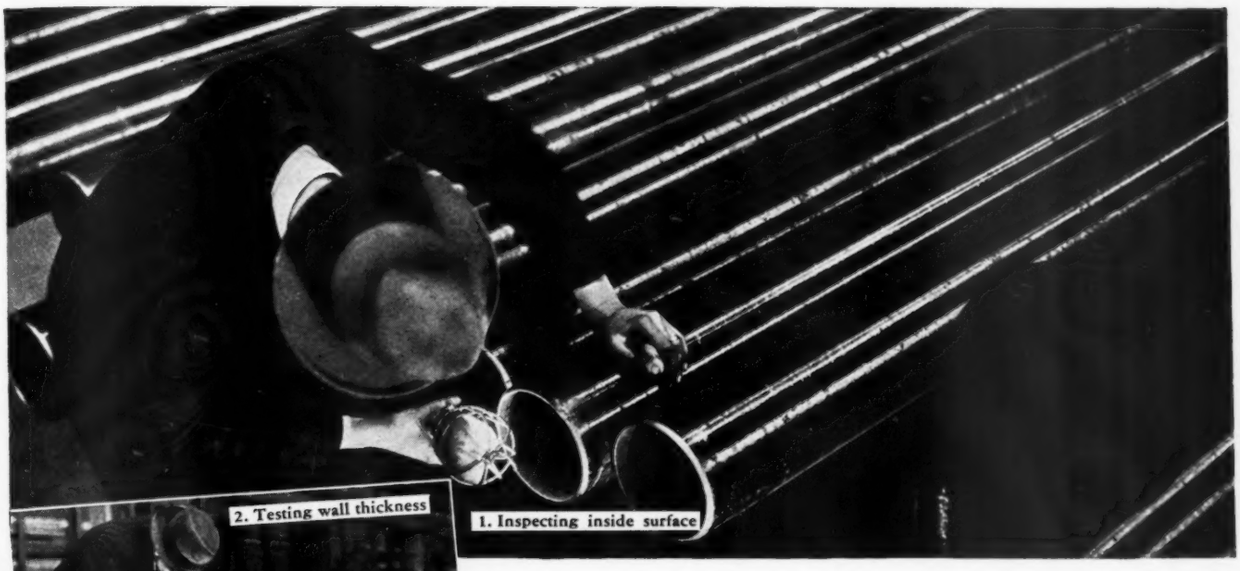
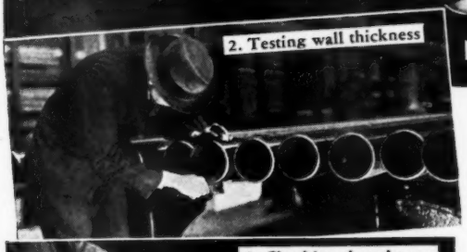
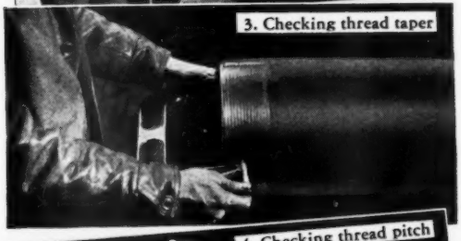
NUMBER 1 DRAKE DRIVE
Raybestos



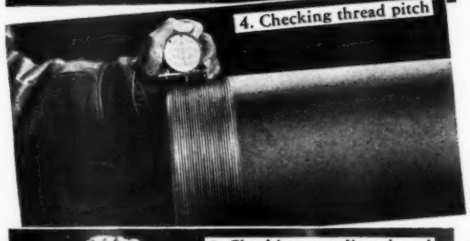
1. Inspecting inside surface



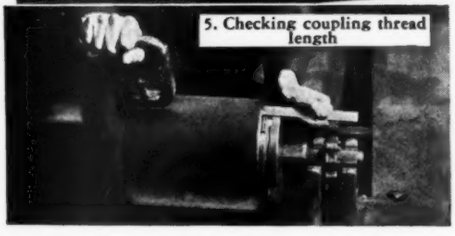
2. Testing wall thickness



3. Checking thread taper



4. Checking thread pitch



5. Checking coupling thread length

Every SIXTH MAN works for you . . . Checking and Inspecting J&L PIPE Quality

When you specify J & L Seamless Steel Pipe you are sure of uniform high quality because every sixth man in the J & L Seamless Tube Department is really *your* man. He works for you, as truly as though he were on your own payroll.

Five men out of every six work for quality—quality in line with J & L's high standards. The sixth man checks and inspects J & L pipe to make sure that you get that quality. At the left, are shown a few of the many careful tests and inspections that safeguard J & L pipe quality for users.

This sixth man is one of the big reasons why the J & L mark on pipe is your complete assurance of uniform quality, dependable service and long-time satisfaction. He is one of the big reasons why pipe users throughout the entire petroleum industry look to J & L for all their casing, tubing, drill pipe and line pipe requirements.

Specify J & L Seamless for maximum satisfaction in casing, tubing, drill pipe and line pipe.

Other J & L products for the petroleum industry include: steel for derricks and other structural purposes; tin and manufacturing terne plate for containers; tank barges; and bars, shapes, plates, steel piling, concrete reinforcing bars, seamless steel boiler tubes, wire and nails, for maintenance, construction and repairs.

The J & L Warehouse at Memphis carries, under cover, large and diversified stocks of oil country tubular products ready for immediate shipment for Mid-Continent, Southwestern and Gulf Coast regions. Also, J & L distributors maintain large stocks at strategic points in these fields and in California.

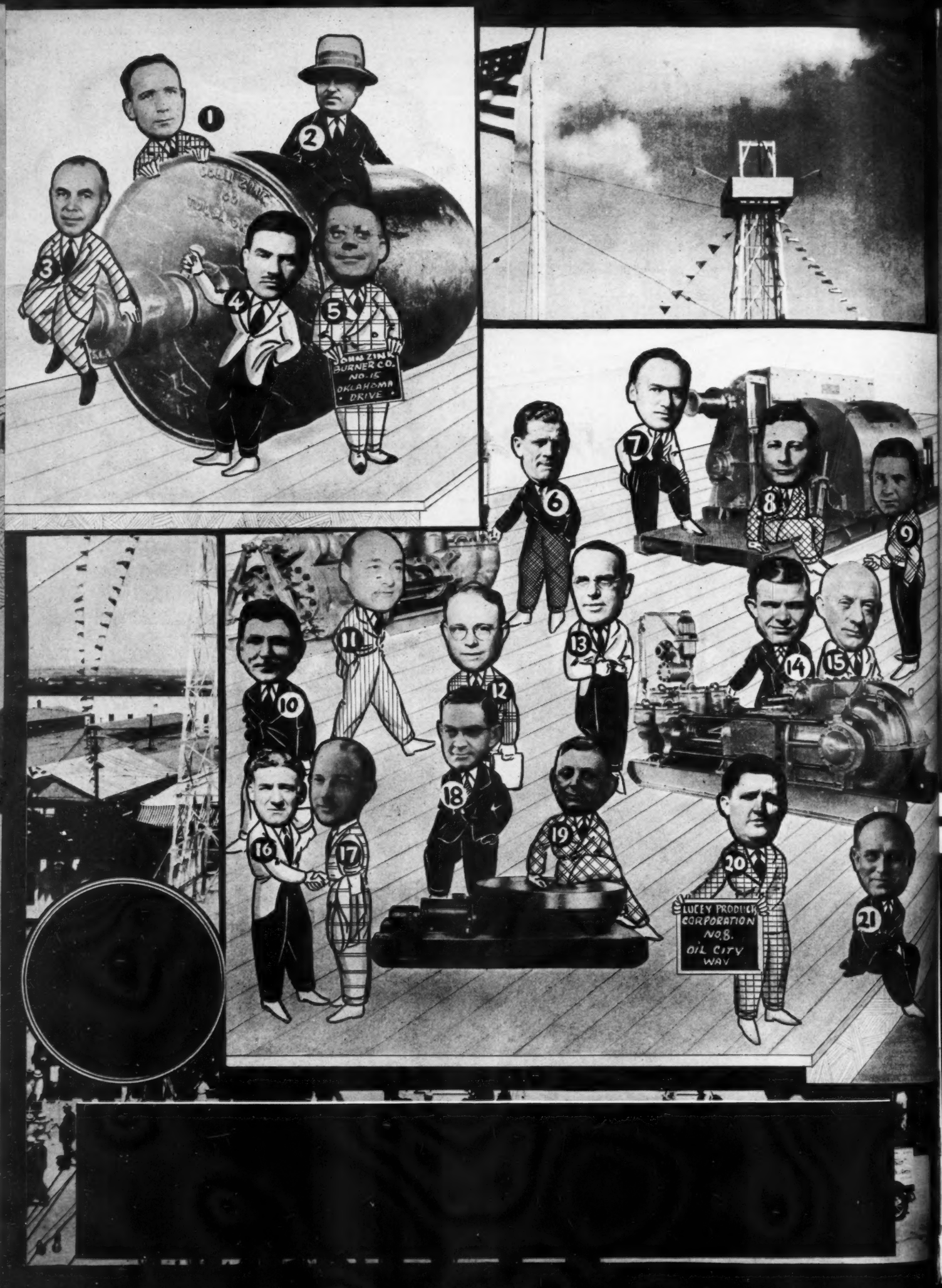
JONES & LAUGHLIN STEEL CORPORATION
AMERICAN IRON AND STEEL WORKS
PITTSBURGH, PENNSYLVANIA

J&L PIPE

J&L SEAMLESS

DRILL PIPE · CASING · TUBING · LINE PIPE

J&L STEEL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LUCEY PRODUCTS CORPORATION NO. 8. OIL CITY WAY
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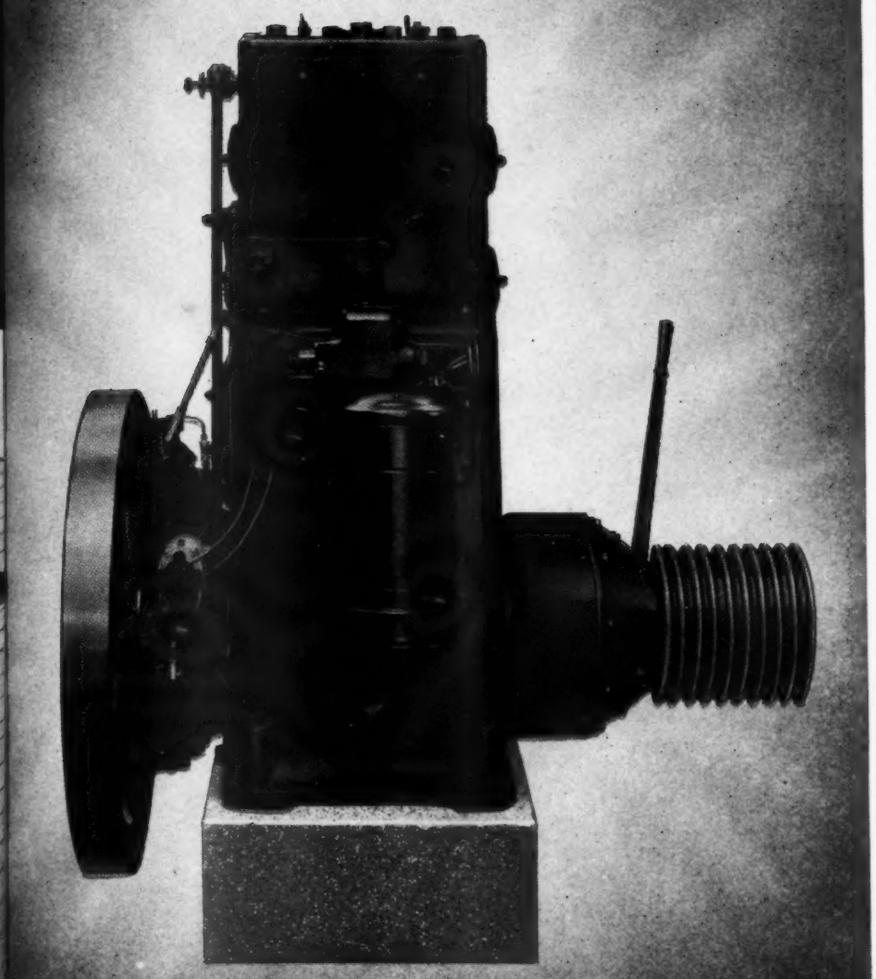
A BETTER 40-HORSE VERTICAL PUMPING ENGINE



COMPACT AND LIGHT — YET BUILT TO LAST!

LOOK AT THESE FIELD-PROVED FEATURES!

—Rated 40 H.P. at 400 r.p.m., it weighs and costs much less than horizontals.

—Low installed cost (minimum foundation and housing).

—Low lubricating cost (because of crossheads).

—Sturdy, counterbalanced crankshaft.

—Heavy-duty roller bearings.

—Equipped with constant or variable-speed governor, air filter, lube-oil pump filter and water pump.

—Can be equipped to drive radiator fan.

—Clutch or straight pulley drives.

—Convertible for gas or oil fuel.

—Can be equipped for air starting.

COOPER-BESSEMER

Announces the

TYPE **G-SD**

NOW YOU CAN HAVE SLOW-SPEED RELIABILITY IN HIGH-SPEED ENGINE SPACE!

This is a real "he-man" pumping engine (2-cycle gas or Diesel) that is cheap to install on a minimum foundation, and cheap to run! Impartial observers have pronounced Type G-SD the outstanding engine of its type — "better designed and better engineered." And the units now operating in the field have shown far better performance than even Cooper-Bessemer expected. Talk to our representative about this new 40-horse Vertical. It WILL LOWER YOUR PUMPING COSTS.

THE COOPER-BESSEMER CORPORATION

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Magnolia Bldg., Dallas, Texas
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EASIER *to make up and far*

High-Yield Casing makes up easier. Try it!

See for yourself how fast it can be set.

The threading of High-Yield Casing is one of the big reasons why the Wave of Acceptance rolls on. HIGH-YIELD Casing offers new and greater factors of safety in "running pipe."

The Wave of Acceptance Rolls On—
HIGH-YIELD Casing is now available, threaded and coupled, in 8⅝"—9⅝"—10¾"—11¾" and 13⅜"—Slip Joint, for running welded, in 11¾" to 22" incl.

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Milwaukee • Wisconsin

BRANCH OFFICES: NEW YORK • TULSA • HOUSTON • LOS ANGELES

MORE FOR YOUR MONEY HIGH YIELD CASING **LOWER-COST WELLS**

INTERNATIONAL PETROLEUM EXPOSITION 1936 — 9th WORLDS FAIR OF OIL HOUSTON TULSA U.S.A.

BETTER *joints when made!*

Manufactured under
U. S. Patent No. 1,993,842

HIGH-YIELD CASING

Making Steel work for you as it never did before

© A. O. Smith Corp., 1936

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Deep wells . . . high pressure

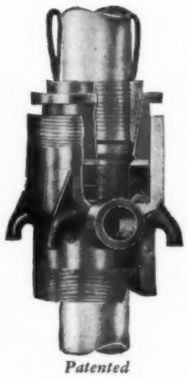
NEED AMERICAN EQUIPMENT

IRON & MACHINE WORKS CO.

to assure positive safety!!

American

CASING SUSPENDER



Patented

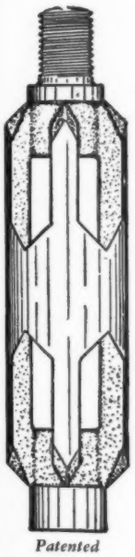
Especially designed for use where high pressure or where several sands are encountered. Prevents blowouts between strings of casing; allows suspension at any point in hole; has outside thread for use should well go wild. Tested to 5000 pounds.

American

SUCKER ROD COUPLING

and

PARAFFIN SCRAPER



Patented

A dependable tool that is strong, safe and durable. A valuable tool for keeping paraffin out of tubing; as guide for crooked holes; to take whip and slap out of rods; to prevent a worn string of tubing; to help eliminate pulling rods. Insures perfect drop of traveling valve. One piece, special heat treated alloy steel.

American

TIE DOWN COMPANION FLANGE

Patented

. . . takes the place of the old style casing clamps and eliminates use of pipe-nipples between valves in hook-ups on high pressure wells, and at the same time provides a correct means for tieing the Christmas tree together. Both sides of clamp are accurately machined and grooved to fit flange in any type gate valve. Made with lugs on each end, and drilled for use with either bolts or stirrups. Will withstand 10,000 pounds pressure with a wide margin of safety.

WRITE TODAY . . . for complete and detailed information about these and other fishing, drilling or production tools and equipment.

SEE YOU AT THE INTERNATIONAL PETROLEUM EXPOSITION 1936
9TH WORLDS FAIR OF THE OIL INDUSTRY TULSA, U.S.A. MAY 16 TO 23

AMERICAN IRON & MACHINE WORKS CO.

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Export Office: 420 Lexington Ave., New York City

INTERNATIONAL SUPPLY CO. and OKLAHOMA IRON WKS No. 5 OKLAHOMA CITY AVE
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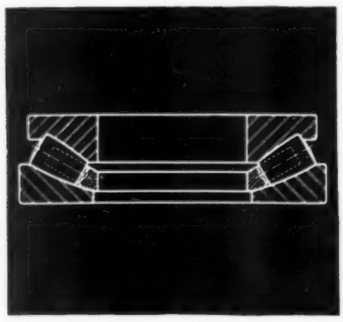
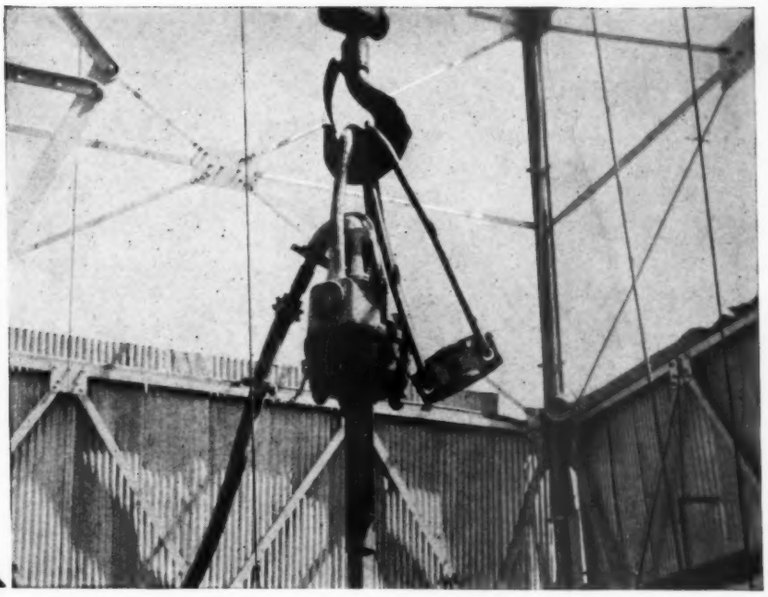
WHO THEY ARE

SKF-EQUIPPED
BUILT BY
EMSCO DERRICK
& EQUIPMENT CO.





FOR NINE YEARS

SKF *and Emsco have worked together in the oil fields*

It is characteristic of the Emsco Derrick & Equipment Company, who for nine years have used SKF Bearings, that they specified an SKF Spherical Roller Thrust Bearing on this new Type "D" Oil-Cooled Swivel with its air-cooled washpipe.

They knew from the good performance of the SKF Bearing on other Emsco products that it is the logical bearing for this equipment. So they put an SKF at the principal thrust location of the swivel, where it took continuous thrust loads for 770 hours with no trouble at all.

The SKF Spherical Roller Bearing insures equalized load distribution with full capacity and long life. Be sure to see the SKF exhibit at the International Petroleum Exposition.

SKF INDUSTRIES, INC., FRONT ST. & ERIE AVE., PHILA., PA.

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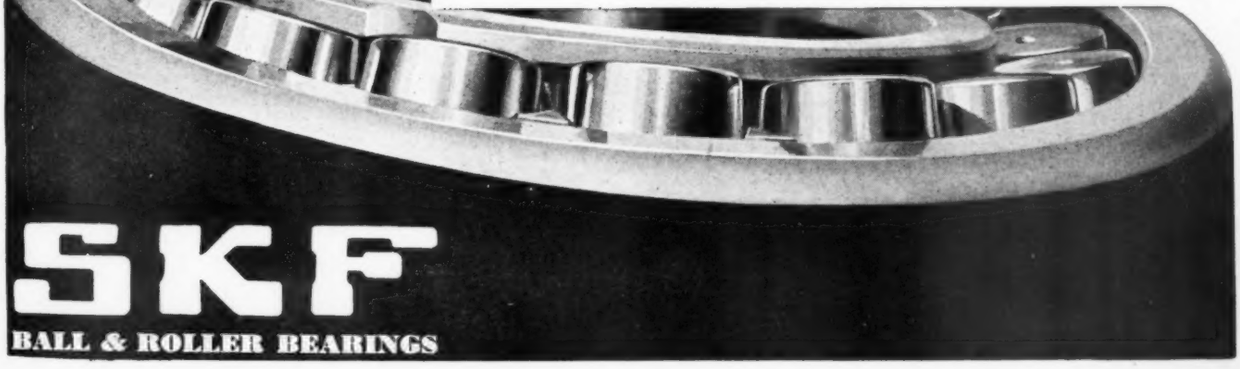


SKF
BALL & ROLLER BEARINGS

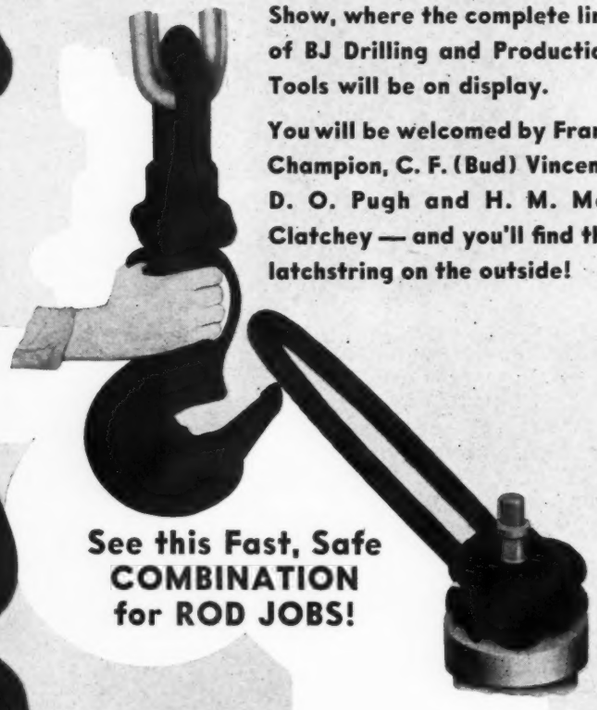
Here's Your Invitation to visit th

We are looking forward to having you visit Booths 24, 25, 26, 27, 28 in the Oklahoma Building at the Tulsa Show, where the complete line of BJ Drilling and Production Tools will be on display.

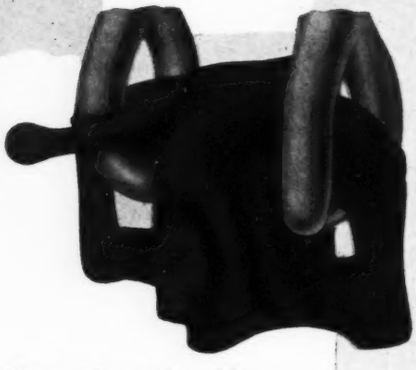
You will be welcomed by Frank Champion, C. F. (Bud) Vincent, D. O. Pugh and H. M. McClatchey — and you'll find the latchstring on the outside!

SEE the BJ TRIPLEX HOOK that you've heard so much about!

WITH *"Locking Arm"* SAFETY



See this Fast, Safe COMBINATION for ROD JOBS!



Examine the New Type A Elevator—

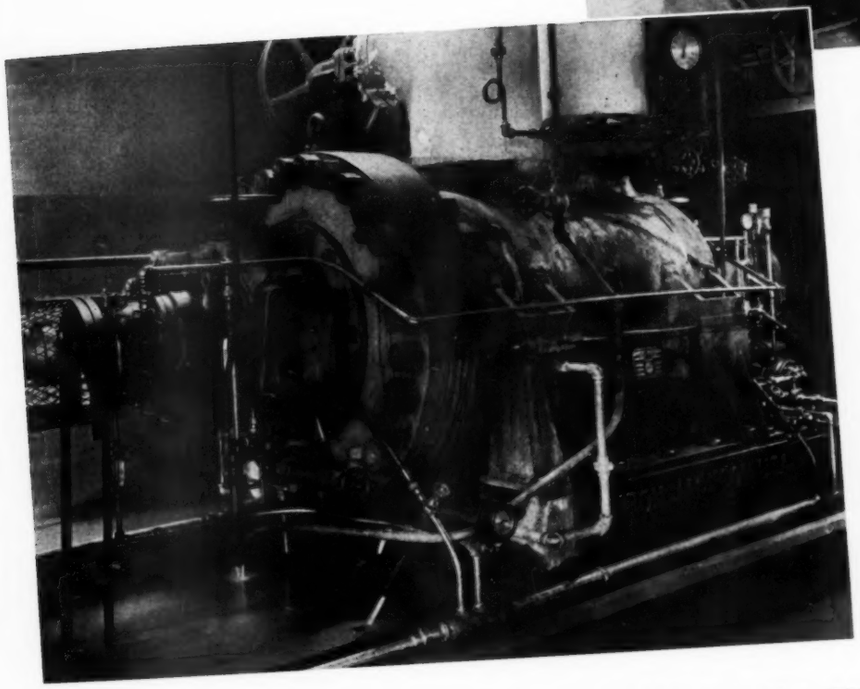
Safer — Faster!

Learn how the BJ SURESTOP TUBING CATCHER "Anchor Method" increases production, provides safety, and eliminates coupling wear.

Modern Tools for DRILLING AND PRODUCTION

it the BYRON JACKSON Exhibit

PUMPS THAT *Reduce Costs* IN REFINERY and PIPE LINE OPERATION



This Byron Jackson-Rannett Pump of the Great Lakes Pipe Line Company has proven revolutionary in introducing lower station and operating costs in the distribution of gasoline from Oklahoma refineries to Kansas City, St. Louis, Chicago, Minneapolis, St. Paul and Omaha.

The Rannett design, incorporating the pump and motor as a self-contained unit structure, takes advantage of the fact that the liquid is a better heat transfer medium than air. The motor is cooled by the continuous circulation of the liquid pumped.

Another example of Byron Jackson leadership. This Hot Oil Charging Pump, in the cracking unit of the Atlantic Refining Company at Point Breeze, Pennsylvania, delivers 1350 GPM hot oil, at a pumping temperature of 700° F., against a discharge pressure of 1100# gauge. The motor normally drives the pump, the turbine serving only as a standby in event of electric power failure.

Since 1872

BYRON JACKSON CO.

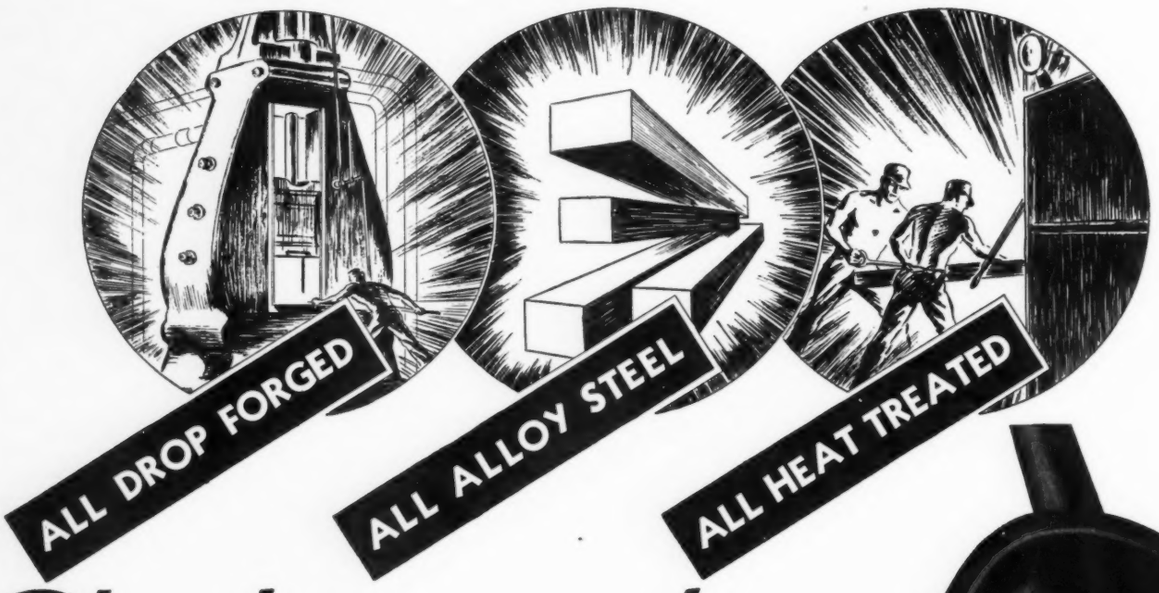
and subsidiary

Factories at: Berkeley and Los Angeles, California
Bethlehem, Pennsylvania

Sales Offices: New York, Salt Lake City, Fort Worth.

BYRON JACKSON

CENTRIFUGAL PUMPS FOR EVERY SERVICE



These features make

New TRIMO-ALLOY

SAFER • STRONGER
MORE SERVICEABLE

TRIMO

New TRIMO ALLOY PIPE WRENCH
MADE ENTIRELY OF HEAT TREATED CHROME-MOLYBDENUM MANGANESE & NICKEL STEEL ALLOYS

And TRIMO gives you more than safety and service. Its swinging frame makes possible that 3/32 inch added flexibility, resulting in swift, smooth ratchet action on any pipe wrench job. • Modernize your equipment with TRIMO—the wrench that grips hard but releases its hold when you want it to. Use TRIMO—the safest, most efficient pipe wrench known in the oil fields.

TRIMONT MFG. CO., INC.
ROXBURY (Boston) MASS.

Other **TRIMO** *Products*
known for dependable service
TRICROME CUTTER WHEELS
TRIMO CHAIN WRENCH
TRIMO PIPE CUTTERS

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The LUNKENHEIMER COMPANY
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OKLAHOMA BLDG.
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MARTIN-DECKER CORP.
BOOTH 12
TEXAS BUILDING
BAILEY METER CO.
BOOTH 34
SCIENTIFIC AND TECHNICAL BLDG.
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EASTMAN OIL WELL SURVEY COMPANY
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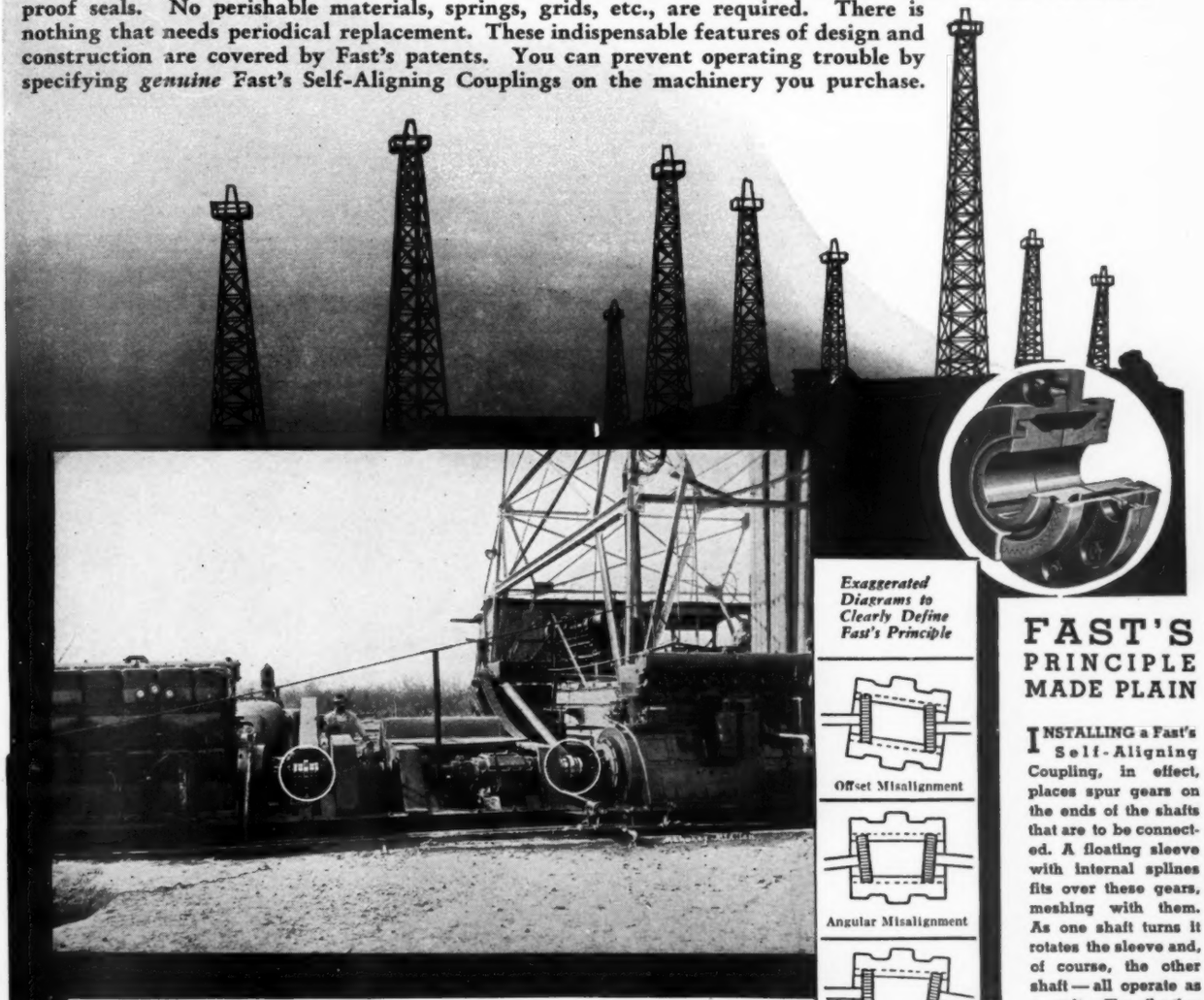
SCIENTIFIC & TECHNICAL BLDG.
HAPPY BELTING COMPANY
BOOTH 1-2
OKLAHOMA BLDG.
BAIRD MFG. COMPANY
BOOTH 7
ARCADE
BOOTH 69
TEXAS BLDG.
ALLEN-SPROULL-ALLEN
BOOTH 10
SCIENTIFIC & TECHNICAL
GEORGE J. FIX CO.
and
BALDWIN DUCKWORTH CHAIN CORP.
BOOTH 9-10
TEXAS

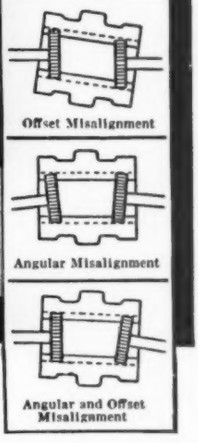
Experience has made FAST'S COUPLINGS *the standard on drilling rigs*

EXPERIENCE on "tough" jobs where delay costs thousands of dollars in liquid gold has caused engineers to specify *genuine* Fast's Self-Aligning Couplings on drilling rigs, pump drives and other field and refinery equipment. Experience has proved that Fast's Couplings will give trouble-free performance during the entire life of the connected machines. There are many sound reasons for Fast's unparalleled reputation with practical oil men. The load-carrying surfaces are protected against wear by a positive film of oil. This oil is kept permanently clean by the rocking bearings which make dust and moisture proof seals. No perishable materials, springs, grids, etc., are required. There is nothing that needs periodical replacement. These indispensable features of design and construction are covered by Fast's patents. You can prevent operating trouble by specifying *genuine* Fast's Self-Aligning Couplings on the machinery you purchase.



Fast's Self-Aligning Couplings on Sheldon-Burden drilling rig. The Mercedes Petroleum Company.

Exaggerated Diagrams to Clearly Define Fast's Principle



FAST'S PRINCIPLE MADE PLAIN

INSTALLING a Fast's Self-Aligning Coupling, in effect, places spur gears on the ends of the shafts that are to be connected. A floating sleeve with internal splines fits over these gears, meshing with them. As one shaft turns it rotates the sleeve and, of course, the other shaft — all operate as a unit. The floating sleeve forms a dust and moisture proof jacket that contains oil which prevents wear.

THE BARTLETT HAYWARD COMPANY
BALTIMORE, MARYLAND

NEW DEAL
SPECIALTY Co. Inc.
No. 11
OKLAHOMA DRIVE
TRACKSON CO.
No 7
FITTS STREET
IDECO
INTERNATIONAL DERRICK
AND EQUIPMENT CO...
NO. 10 DRAKE DRIVE

WHO THEY ARE

See Them at the 9th International PETROLEUM EXPOSITION

"BEN-FRANKLIN" SPECIAL

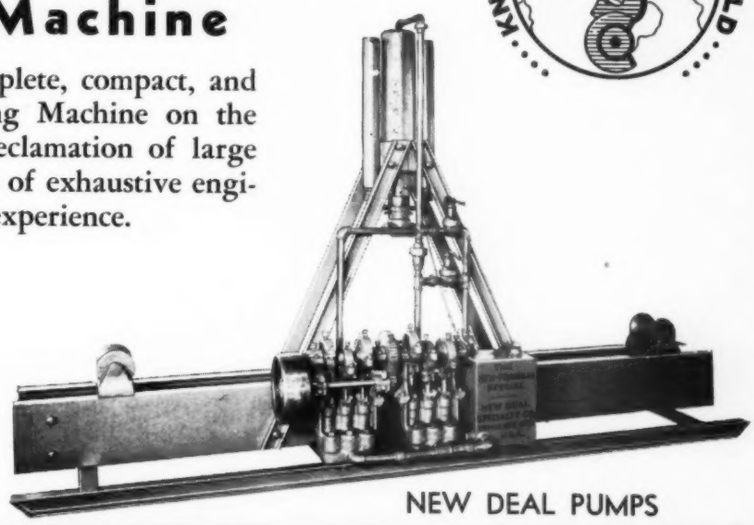
Duo-Hydraulic Pipe Straightener and Bending Machine

KNOWN AROUND THE WORLD

The "Ben-Franklin" Special is the most complete, compact, and modern Pipe Straightening and Pipe Bending Machine on the market. Insures satisfactory and economical reclamation of large quantities of bent and crooked pipe. The result of exhaustive engineering study and research and years of field experience.

FEATURES

A. Hydraulic Cylinder.
B. Shoes Scientifically Designed to Fit the Pipe. (3 shoes for 3 major changes in arc of pipe, standard equipment on each machine).
C. Special Return Springs, made to our order. (Exclusive on these machines.)
D. Springs Enclosed for Safety.
E. Adjustable Carrying Rollers Designed Not to Kink the Pipe.
F. Exclusive Hi-Pressure Quick Acting Valves (Patented Exclusive Feature).
G. Steel Frame.
H. Steel Sled.
I. New Deal's Own Pump, Used Exclusively on These Machines.
J. Fluid Tank.
K. Hi-Pressure Pump as Used in Model "C".
L. Hi-Speed Pump as Used in Model "B". You get BOTH in Model "D".



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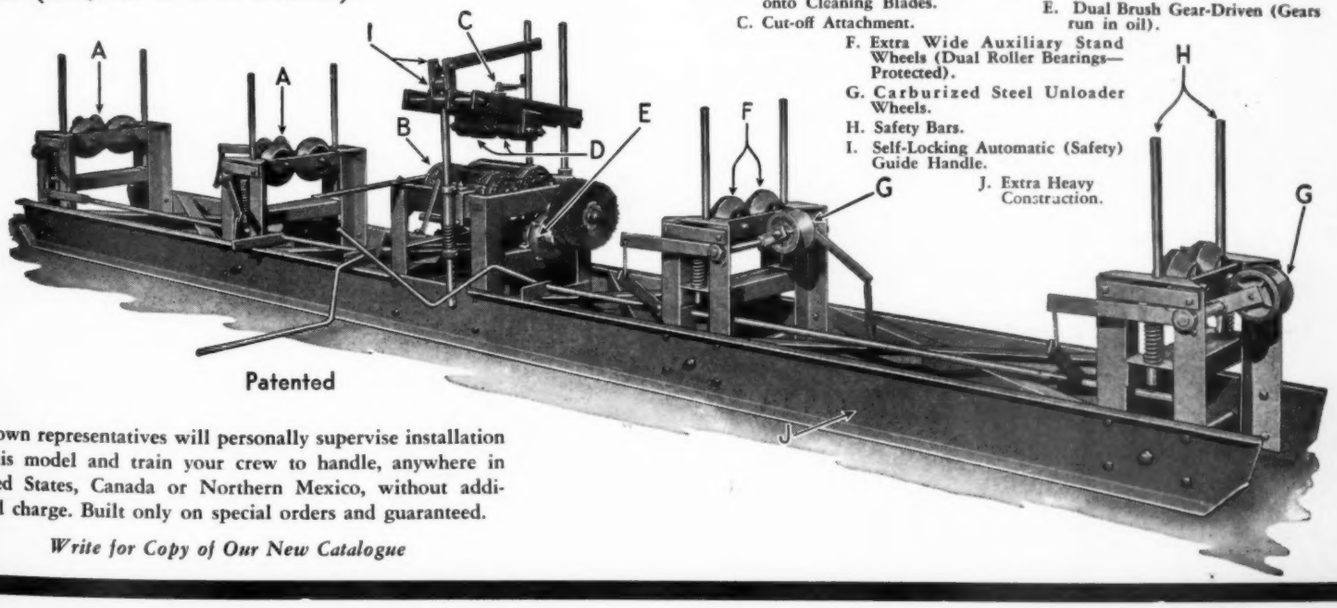

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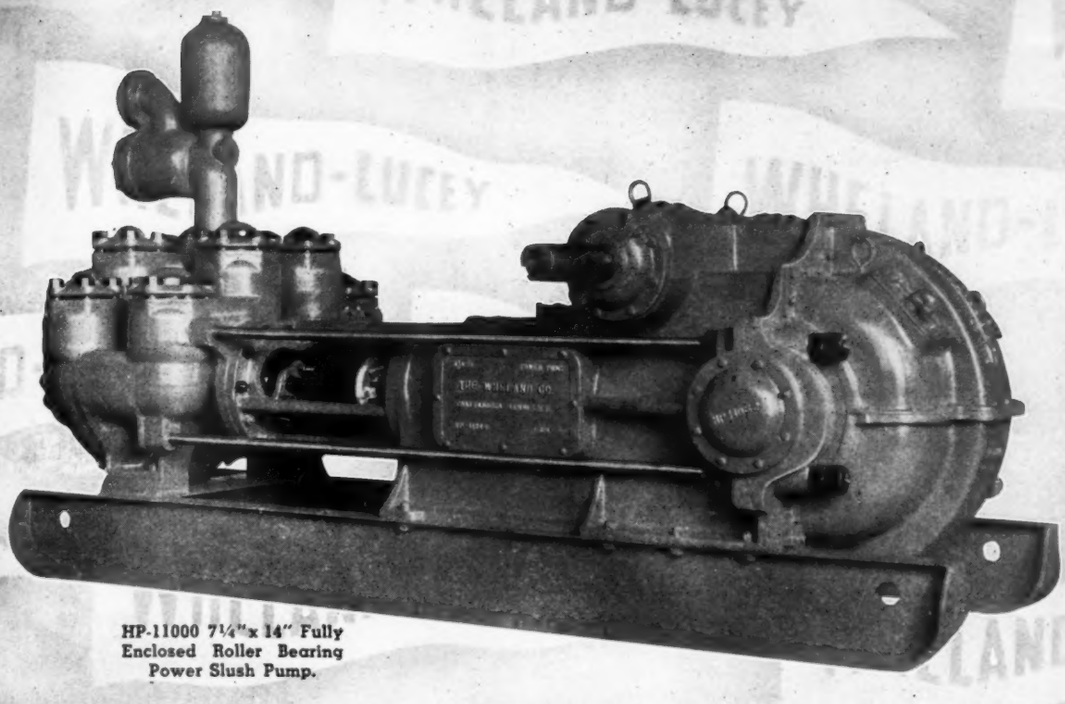

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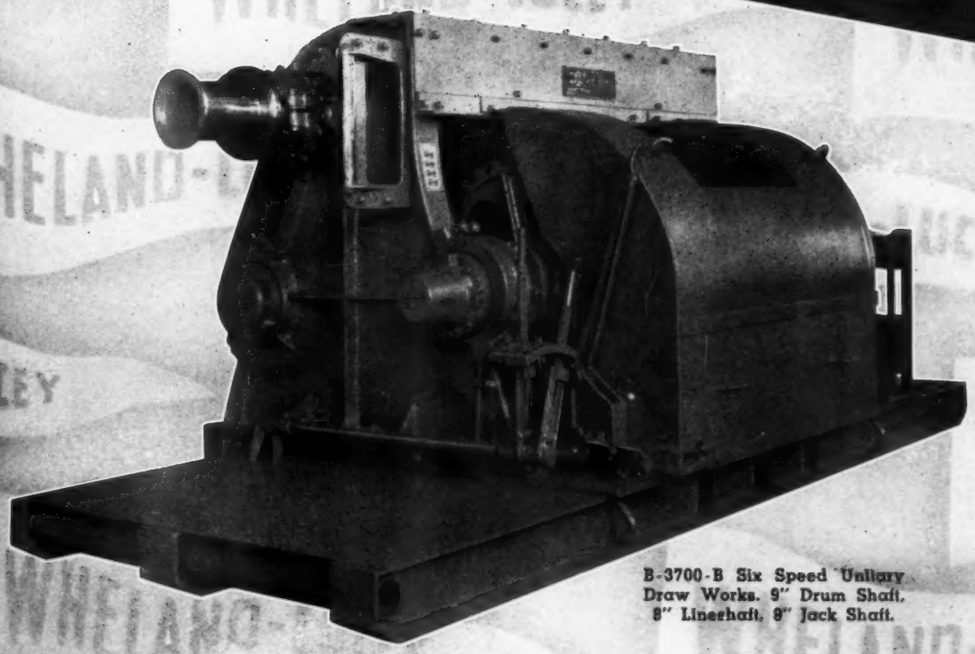

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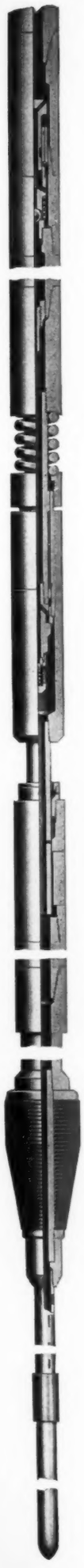

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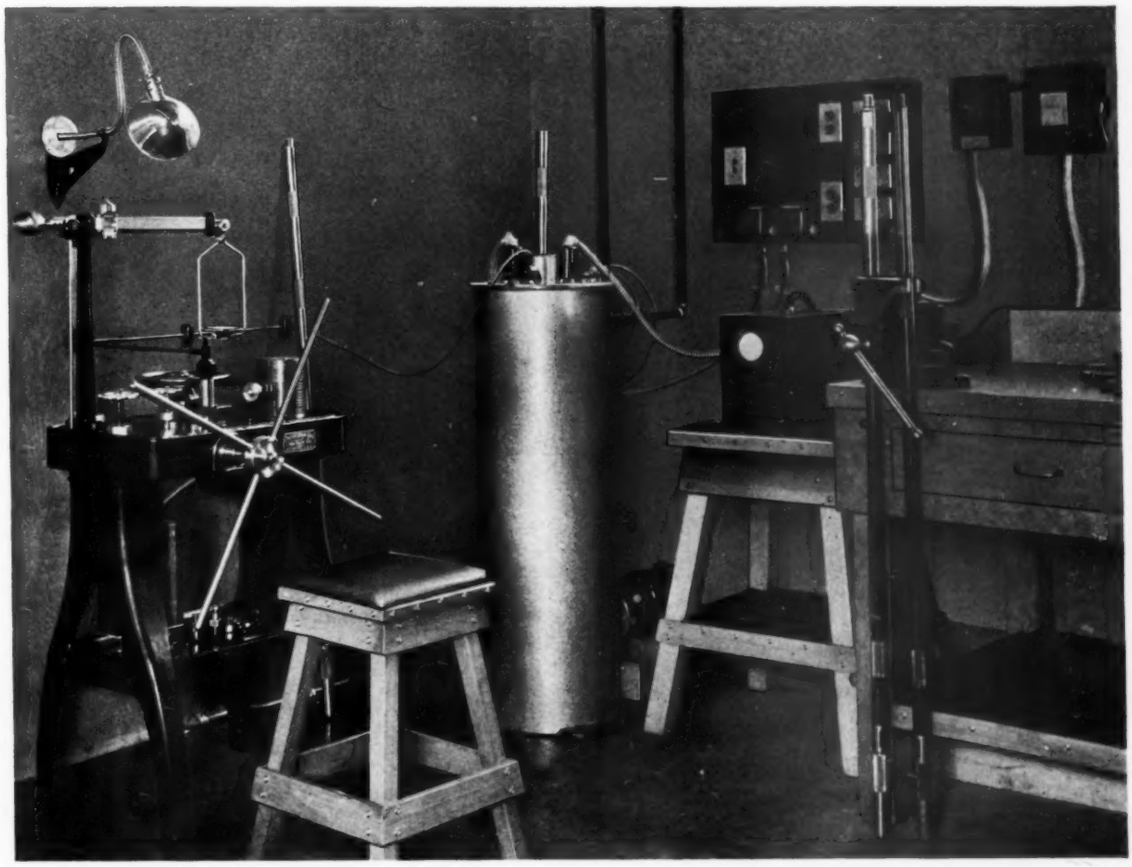

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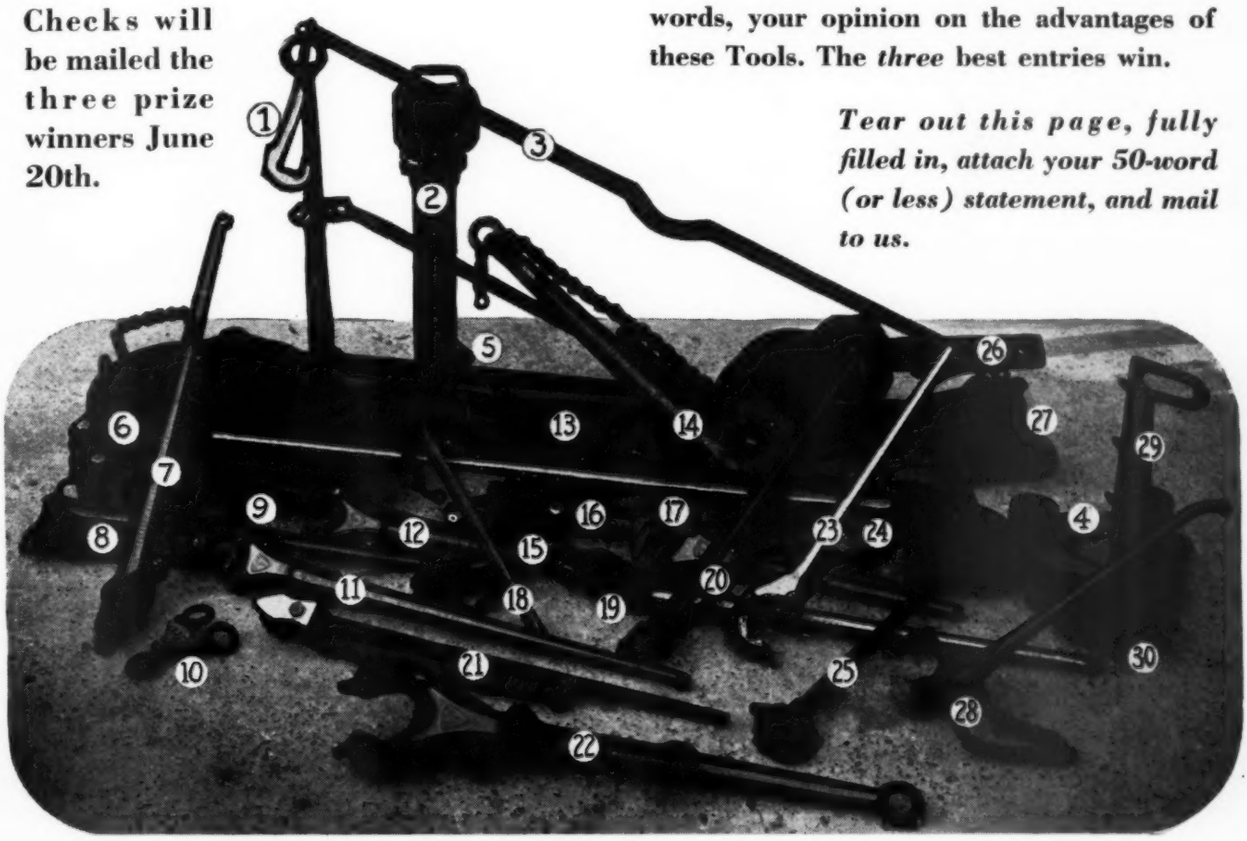
By what you know about them

It's Easy. . . . Just identify the tools shown here by the numbers, and write the names opposite the same number in the blanks below. Then write us, in not more than 50 words, your opinion on the advantages of these Tools. The *three* best entries win.

Checks will be mailed the three prize winners June 20th.

Tear out this page, fully filled in, attach your 50-word (or less) statement, and mail to us.



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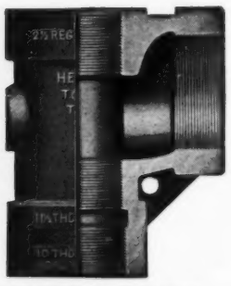

HERCULES Upset Thread
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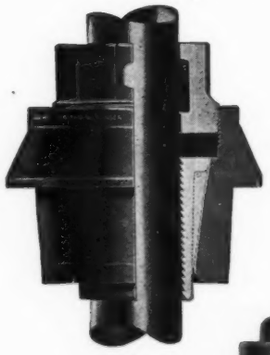

HERCULES
Tubing
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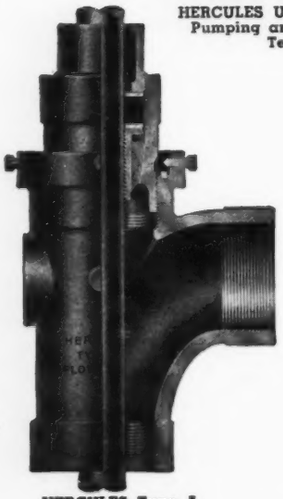

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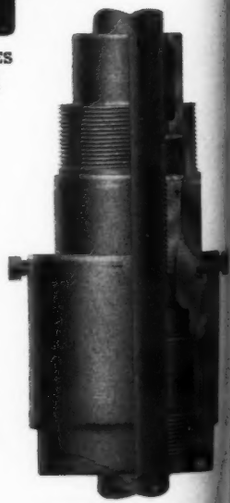

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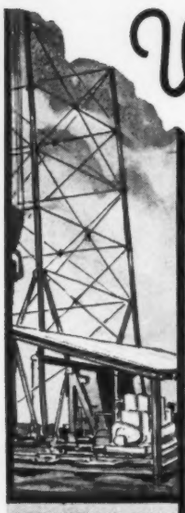
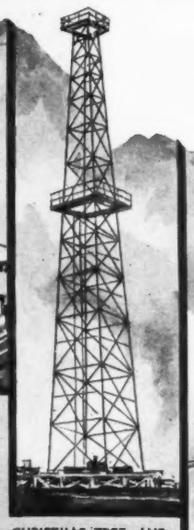


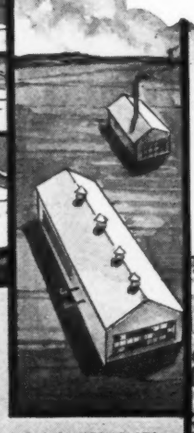
MISCELLANEOUS USES IN PRODUCTION



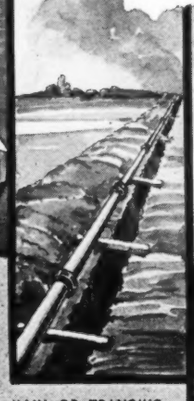
CHRISTMAS-TREE AND OTHER HOOK-UPS AT THE WELL

FLOW LINES TO AND FROM SEPARATORS

GATHERING, FIELD-STORAGE, AND TANK-BATTERY LINES

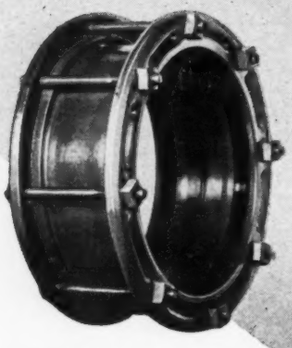


FIELD PUMPING STATION LINES TO MAIN LINE STATION

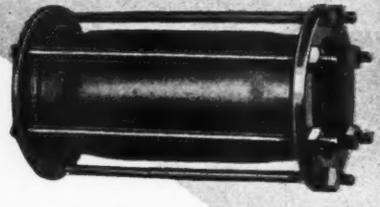


MAIN OR TRANSMISSION LINES TO REFINERIES

MANY TYPES OF LINES IN REFINERIES AND NATURAL-GASOLINE PLANTS



Dresser Steel Coupling, Style 38, 12" I.D.



Dresser Long Sleeve, Style 40, 8" I.D.

Dresser Service Coupling, Style 38, 1¼" I.D.

* Dresser Compression Coupling, Style 65, 2" I.D.

There are scores of applications where "Dressers" save you time, trouble, and money—because they make tight connections so quickly.

For example, a few hours saved in making connections at a new well may result in hundreds of dollars additional earnings.

All along the line—from well to market—there is a type and size of Dresser Coupling or Dresser Sleeve to fit every joining job—giving you the advantages of *permanent tightness, flexibility, simplicity, strength,* and *TRUE* economy.

*** Write for Folder No. 361, describing the new Dresser Compression Fittings.**

S. R. DRESSER MFG. COMPANY, BRADFORD, PA. *In Canada:* Dresser Mfg. Company, Ltd., 32 Front Street, West, Toronto, Ontario

GENERAL ELECTRIC COMPANY
SPANG & CO.
Booth 47-58
CALIFORNIA BLDG.
CHAPLIN-FULTON MFG. CO.
Booth 40
SCIENTIFIC AND TECHNICAL BLDG.
SEALED POWER CORPORATION
Booth 21
REFINERS & MARKETERS BLDG.
The CONCRETE SURFACING MACHINE-RAY COMPANY.
Booth 10
ARCADE BLDG.
ENSIGN CARBURETOR CO., LTD.
Booth No. 47
CALIFORNIA BLDG.
WHO THEY ARE

HERCULES MOTORS CORP.
NO 76-135
OKLAHOMA BUILDING
WALWORTH Co.
NO 104-107.
OKLAHOMA BUILDING
SPANG CHALFANT & CO.
NO 44-45.
TEXAS BLDG

Unretouched Photo, Lease of Major Operator in East Texas Field.

there is a **LUFKIN** for your every need!

BEAUTY... *Combined with efficiency...*

Attractive leases were little thought-of until recent years. Now an attractive lease is considered as important as an attractive retail outlet. Oil men have been quick to appreciate the advantages of both.

Lufkin's efficient, trouble-proof equipment lends itself readily to attractive and well kept leases such as the one reproduced above.

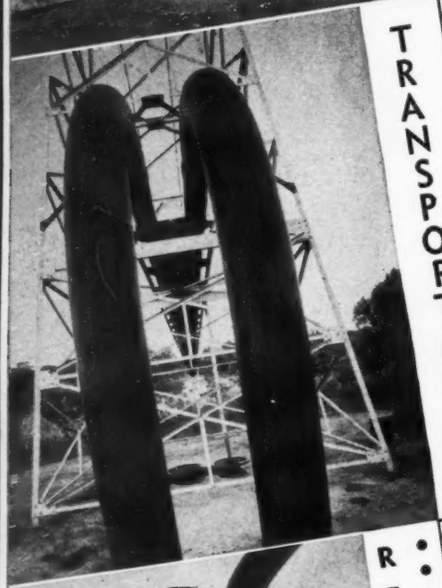
Catalogue No. 36 contains completely illustrated layouts with blue print setting plans and engineering data and will be gladly mailed to oil men anywhere upon request.

1936 INTERNATIONAL PETROLEUM EXPOSITION TULSA, U.S.A.

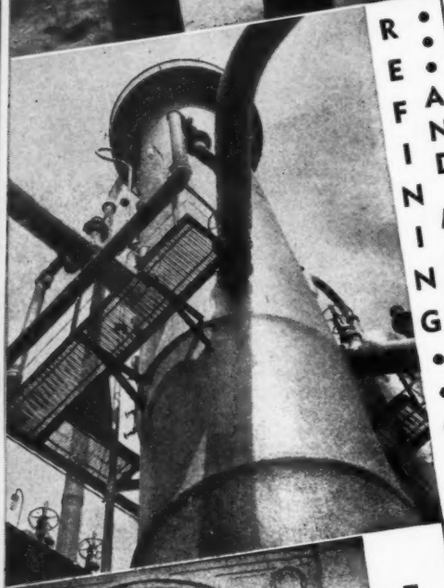
Lufkin

LUFKIN UNITS ARE MANUFACTURED IN LUFKIN, TEXAS BY THE LUFKIN FOUNDRY AND MACHINE CO. • • BRANCHES IN PRINCIPAL OIL FIELDS • •

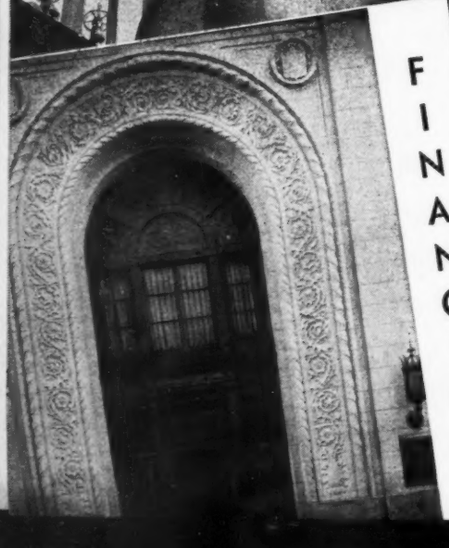
PRODUCTION



TRANSPORTATION



REFINING • • • AND MARKETING



FINANCING

The Oil Bank of America

OIL Industry's headquarters are here in Tulsa, making it the OIL CAPITAL OF THE WORLD.

And here, too, is the OIL BANK OF AMERICA, putting the strength of its financial resources behind every branch of the industry. Individuals and corporations appreciate what this title signifies and daily make use of its service features and the seasoned advice of its officers.

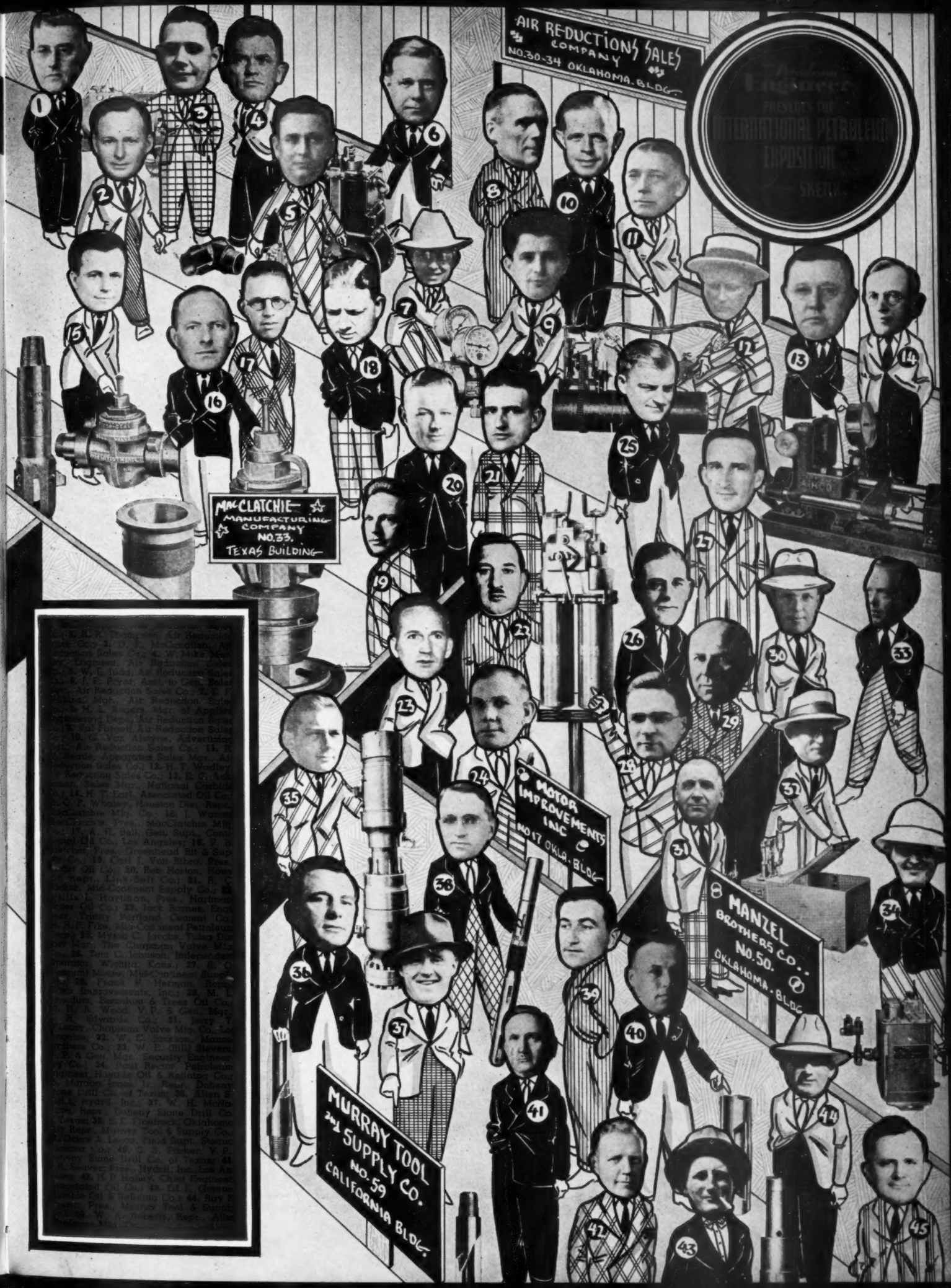
You'll find that the Oil Industry always turns to the National Bank of Tulsa because its outstanding co-operation makes it the OIL BANK OF AMERICA.

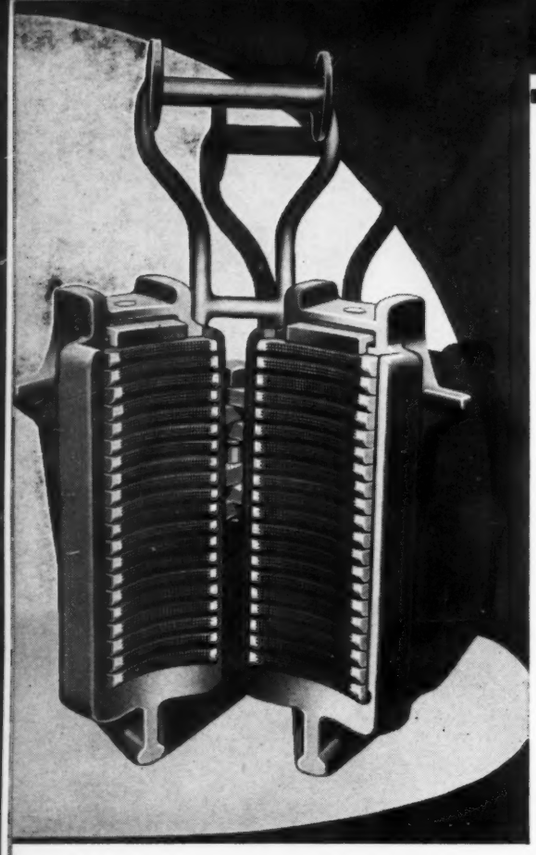
NATIONAL BANK OF TULSA

TULSA, OKLAHOMA

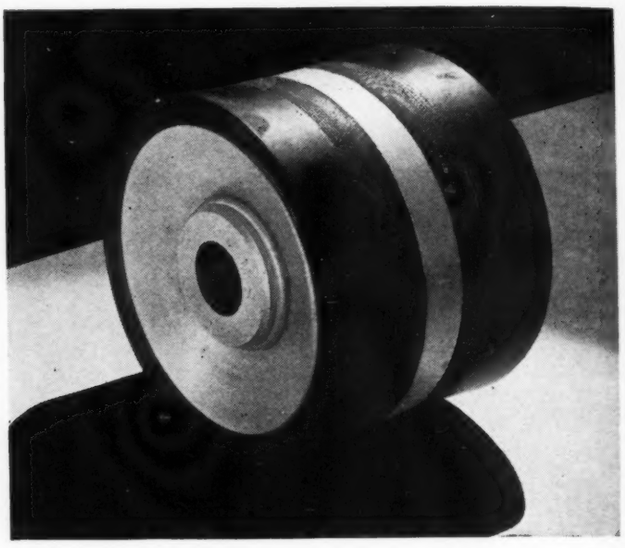
The Oil Bank of America

Member Federal Deposit Insurance Corporation


AIR REDUCTIONS SALES COMPANY
NO. 30-34 OKLAHOMA BLDG.
MACCLATCHIE MANUFACTURING COMPANY NO. 33. TEXAS BUILDING
MOTOR IMPROVEMENTS INC. NO. 17 OKLA. BLDG.
MANZEL BROTHERS CO. NO. 50. OKLAHOMA BLDG.
MURRAY TOOL & SUPPLY CO. NO. 59 CALIFORNIA BLDG.



WHY MISSION OIL MEN THE *Time, Money*



NEW MISSION ROTARY SLIPS

MODEL 36

The Unique Mission principle of ROLLING DOGS

POSITIVELY ELIMINATES DANGER OF SLIPS CUTTING OR CRUSHING PIPE . . . Insures against many costly fishing jobs.
. . . Saves pipe . . . Saves money.

BODY OF MISSION SLIPS PRACTICALLY INDESTRUCTIBLE . . . assures buyers practically a permanent investment.

DOGS QUICKLY AND EASILY REPLACED ON DERRICK FLOOR . . . Saves costly delays in taking slips to shop.

MAKING ECONOMY RECORDS the WORLD OVER

IMPROVED MISSION SLUSH PUMP PISTONS

CUT UPKEEP COSTS IN HALF

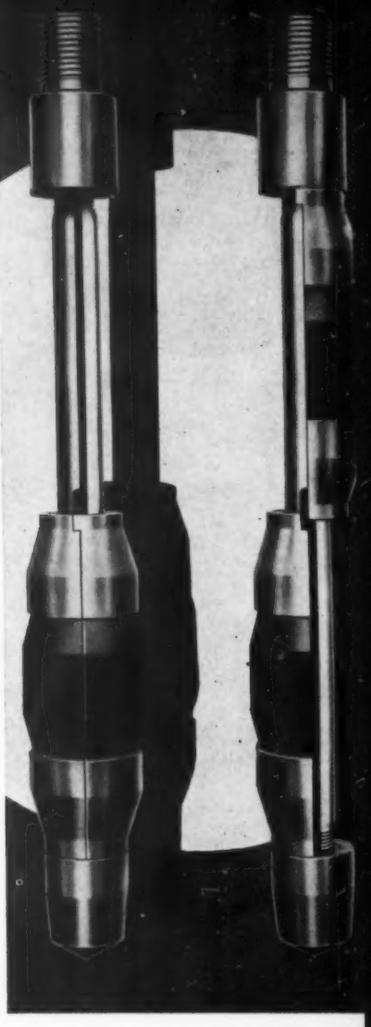
REPLACEABLE RUBBERS ON A PERMANENT BODY . . . SAVE MONEY formerly invested in continuously buying new pistons.

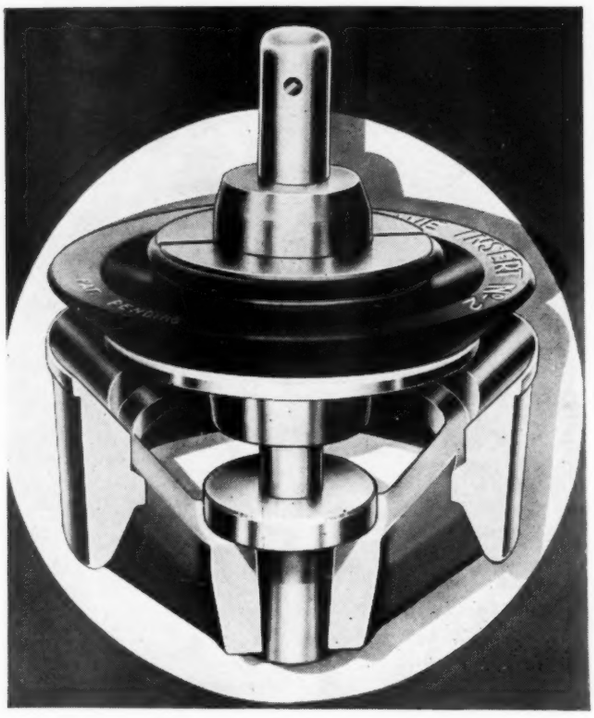
PRINCIPLE OF MORE-RUBBER AND LESS-METAL gives three-times-greater wiping surface, eliminating by-passing . . . INCREASES LIFE of liners and pistons.

LIGHTEST WEIGHT PISTON ON THE MARKET . . . Eliminates drag. DROP FORGED, CHROME NICKEL BODY, ONE-PIECE CONSTRUCTION . . . Resists any pressure.

SOLD THRU SUPPLY STORES EVERYWHERE

PRODUCTS SAVE WORLD OVER *and Trouble*





New Mission Silver Top Valves

LAST 100% LONGER

SAVES MONEY formerly invested in buying new seats for conventional type valves.

SAVES LABOR continuously required for changing seats because of the TIME-PROVEN MISSION PRINCIPLE OF PERMANENT SEAT . . . WITH REPLACEABLE BUSHINGS that take the terrific blows that so quickly destroy the seats in conventional type valves.

BUSHING HELD FIRMLY IN PLACE . . . eliminating wear on valve seat under bushing and on bottom of bushing.

BUSHING EASILY CHANGED . . . by using attachment on Mission Seat Puller.

MISSION VALVELESS SWABS

PARRISH PATENTS

FASTEST FALLING SWAB ON THE MARKET . . . Saves many hours of work in difficult swabbing jobs.

UNRESTRICTED, OPEN FLOW ON DOWN STROKE . . . eliminates a large proportion of the friction wear of rubbers against tubing.

MISSION MANUFACTURING CO.

HUMBLE ROAD . . . . . HOUSTON, TEXAS

WHO THEY ARE

NATIONAL SUPPLY COMPANY
INSIDE SPACE
IDEAL
MB 20" UNIVERSAL

THE ALL-ALLOY RIDGID

The Pipe Wrench with the UNBREAKABLE HOUSING

Housing and handle are made of "RIDGALOY", a remarkable new alloy that doubles the old strength on which RIDGID built its reputation.

Jaws are of chrome molybdenum alloy, entire jaws oil hardened.

RIDGID Wrenches more than meet Government requirements, pass Navy Test No. I-GGG-W-651.

UNCONDITIONAL GUARANTEE
If this Housing ever Breaks or Distorts we will replace it Free
THE RIDGE TOOL CO. ELYRIA, O.
TRADE RIDGID MARK PAT. PEND'G
14

End Pattern, 6" to 36". Same features as regular RIDGID.

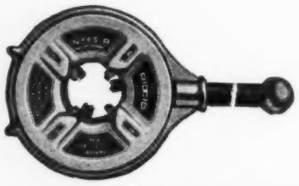
BUT THAT'S NOT ALL

These wrenches win the battles of the oil fields. Strength that equals any. Replaceable heel jaws. Can't be locked on a pipe. Adjusting nut that spins freely in open housing in all sizes. Also made in End pattern for pipes against walls and other tight places. Millions of RIDGID Tools in use all over the world. . . . Ask your Supply Store.

EVERY TOOL HAS SPECIAL FEATURES

RIDGID PIPE CUTTER

Patented thin blade cutter wheel cuts pipe easily, practically no burr because this blade is of finest tool steel, heat-treated and cast in solid hub.



RIDGID THREADERS

This No. 65R threads 4 sizes of pipe with one set of chasers . . . perfect threads under all conditions. New type workholder that tightens with one screw . . RIDGID No. 1 Poster has full-floating posts, the new work-holder and many other exclusive features.

RIDGID "LonGriP" EXTRACTORS

The only screw and pipe extractors that take the "fight" out of a broken threaded end. You drill the broken screw to a thin shell, drive in the *"LonGriP"*, the straight flutes gripping it full length — and turn the broken threaded end out easily.

RIDGID VISES

Yoke and chain vises in bench, post, kit and stand patterns. All have pipe benders and rests. No-Mar jaws in 2" and 2½" capacities. Other features.

THE RIDGE TOOL COMPANY, Elyria, Ohio, U. S. A.

RIDGID

PIPE WRENCHES - CUTTERS - THREADERS - VISES - EXTRACTORS

CRANE COMPANY
BOOTH 50-55 REFINERS and
MARKETERS BLDG
GUFFEY * BACON
MFG CO.
NO 52-54 TEXAS
BLDG
OIL CONSERVATION
ENGINEERING CO
NO 82-129 OKLAHOMA BLDG
ARMSTRONG
MACHINE WORKS
78 TEXAS BLDG.

THE

NATIONAL

SUPPLY *Exhibit*

. . . covers an area of 9480 square feet the largest display of modern oil field equipment at the Tulsa Exposition

AMERICAN
DEHYDRO
DEHYDRO Company
No 5. California Avenue
SULLIVAN
MID CONTINENT SUPPLY CO.
OUTSIDE SPACE

NOW DRILLING THROUGH HEAVING SHALE —SAFE, FAST, ECONOMICAL

THIS DRILL CASING JOINT CAN TAKE IT

A String of Spang-Chalfant casing equipped with the

HYDRIL
EXTERNAL UPSET CASING JOINT

was used in the place of drill pipe to drill through more than 1600 feet of heaving shale encountered between 6424 feet and 8021 feet in a major oil company's well near Seadrift in Calhoun County, Texas. The success of this project is a testimonial to the skill and ingenuity of the Company's engineers and drilling executives and the drilling contractor.

Patented

Check These Important Features

1 Beveled shoulder makes the joint non-creeping under torsional strains of drilling. Provides an outside fluid seal.

2 Square thread places more metal in shear; does not gall; sets up easily without cross threading.

3 Double step thread provides greater strength at the base of the pin and inside of the box.

4 Inside tapered seat forms an effective fluid seal. Supports the inside of the box in tension and in bending.

5 EXTERNAL UPSET PROVIDES EXTRA METAL AT THE JOINT. ANY DESIRED JOINT EFFICIENCY CAN BE SECURED BY VARYING THICKNESS OF UPSET.

All casing manufacturers make pipe for the Hydril External Upset Casing Joint. Threads are cut at the Hydril factories at Torrance, Cal., and Houston, Tex.

Refer to your 1936 Composite Catalog and write for full engineering details.

HYDRIL

HYDRIL COMPANY
714 West Olympic Boulevard, Los Angeles, California
4300 Calhoun Road, Houston, Texas
Cable Address—HYDRIL

OIL COUNTRY SPECIALTIES MFG. CO.
No. 2. SKELLY DRIVE
BRIDGEPORT MACHINE CO.
No. 6
DRAKE DRIVE

ILL[illegible]E PERFECTION

Claims of perfection are obviously untrue. Moore offers the next best thing: excellence, backed by *responsibility* for the continuous performance of Moore equipment.

Moore Walking Beams have an almost perfect service record. Write for Catalog Section K.

DERRICKS

PUMPING EQUIPMENT

Moore

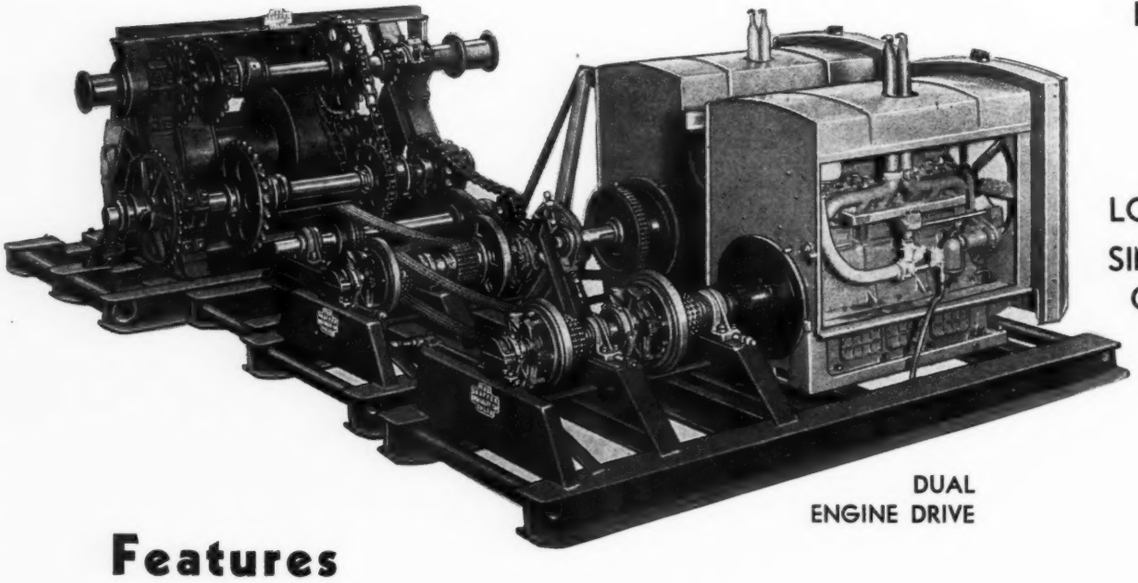
LEE C. MOORE & CO. Inc. Tulsa • Pittsburgh—Member Steel Derrick Manufacturers Association • Dallas • Houston • Henderson • Kilgore
Longview • Midland • Odessa • Pampa • Wichita Falls, Texas • McPherson • Russell • Wichita, Kansas • Stocks in all active fields

Don't Miss it at the Oil Show!

Shaffer Portable Rotary Triple Engine Drive

With low initial cost and economical operation, up keep, and transport, the Shaffer Portable Rotary Drilling Units are designed and built to save you money.

For drilling three to four thousand foot wells with 4½-in. drill pipe, two engines are used of approximately 160 h.p. each. A third engine can be added, without changing any of the assembled units, for deeper drilling or when using 6-in. drill pipe. Adaptable for use with any Draw Works.



DUAL ENGINE DRIVE

ECONOMICAL
DURABLE
FLEXIBLE
PORTABLE
LOW FIRST COST
SIMPLE CONSTRUCTION

Features

- Multiple Roller Chain
- Cut Steel Sprockets
- Friction Clutches
- Self-Aligning Roller Bearings
- All Welded Structural Frames
- Alloy Steel Shafting
- Roller Chain Reverse
- Compounded Engines

SEE YOU AT THE "INTERNATIONAL" PETROLEUM EXPOSITION 1936
9TH WORLD'S FAIR OF THE OIL INDUSTRY TULSA, U.S.A. MAY 16 TO 23

THE SHAFFER SPECIALTY CO.

BOX 136 WHITTIER STATION — TULSA, OKLAHOMA — 2440 EAST KING STREET

U.S. STEEL CORP.
SUBSIDIARIES
BOOTH 93-118
OKLAHOMA BLDG.
AMERICAN STEEL & WIRE COMPANY
WIRE ROPE
U.S. STEEL CORP. and
SUBSIDIARIES.
NATIONAL TUBE COMPANY
AMERICAN STEEL and WIRE CO.
COLUMBIA STEEL CO.
CARNEGIE-ILLINOIS STEEL CORP.
AMERICAN BRIDGE CO.
UNIVERSAL ATLAS CEMENT CO.
CYCLONE FENCE CO.
AMERICAN SHEET & TIN PLATE CO.

TUBING . . . .

DOUBLE STRENGTH STEELS . . . .

LINE PIPE UP TO 16-INCH O. D . . . .

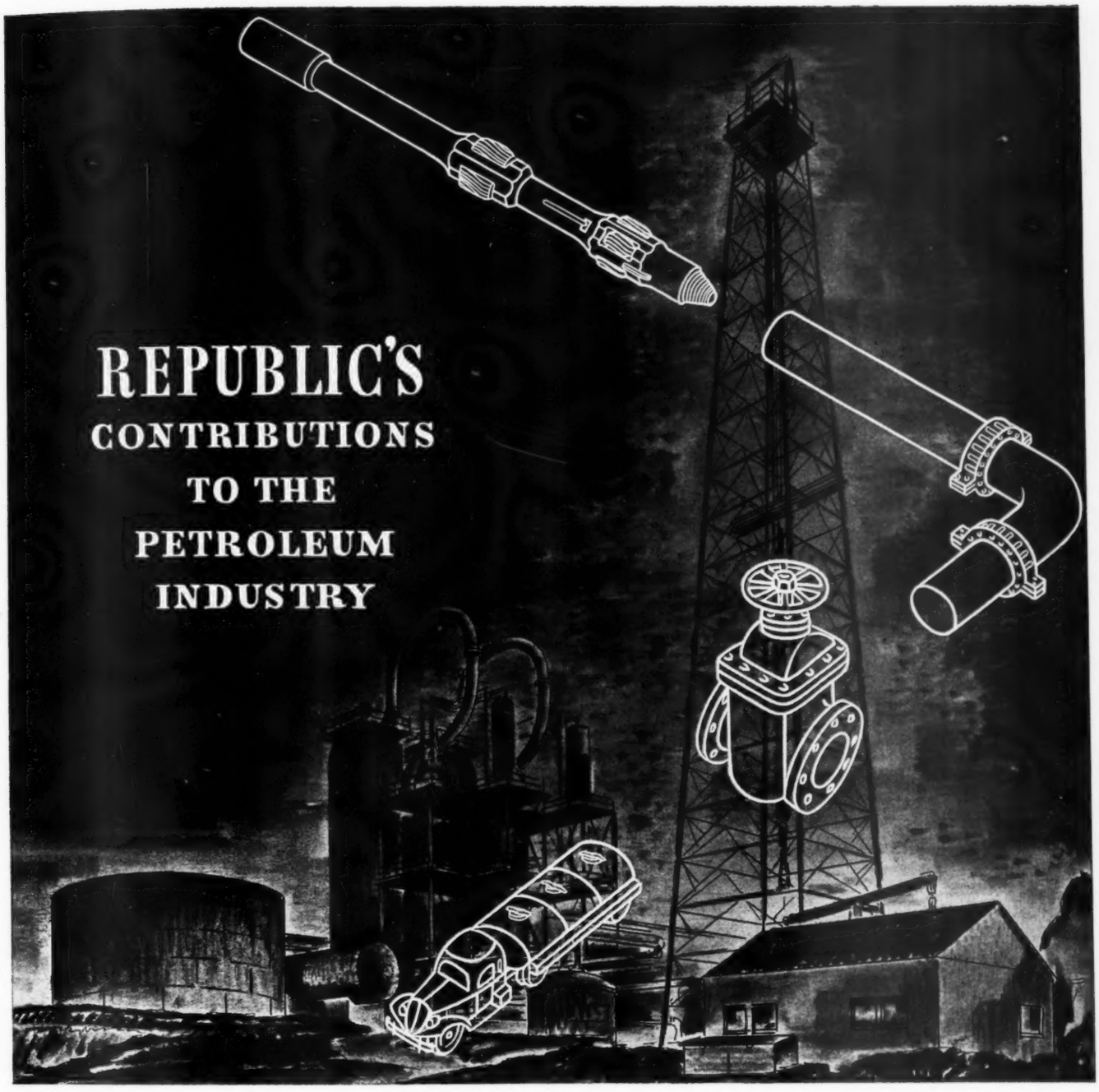
TIME-TESTED ALLOY STEELS . . . .

RUST-RESISTING TONCAN IRON . . . .

HIGH YIELD POINT, HIGH DUCTILITY CASING . .

ENDURO STAINLESS AND HEAT-RESISTING STEELS .

BOLTS, NUTS, RIVETS . . .

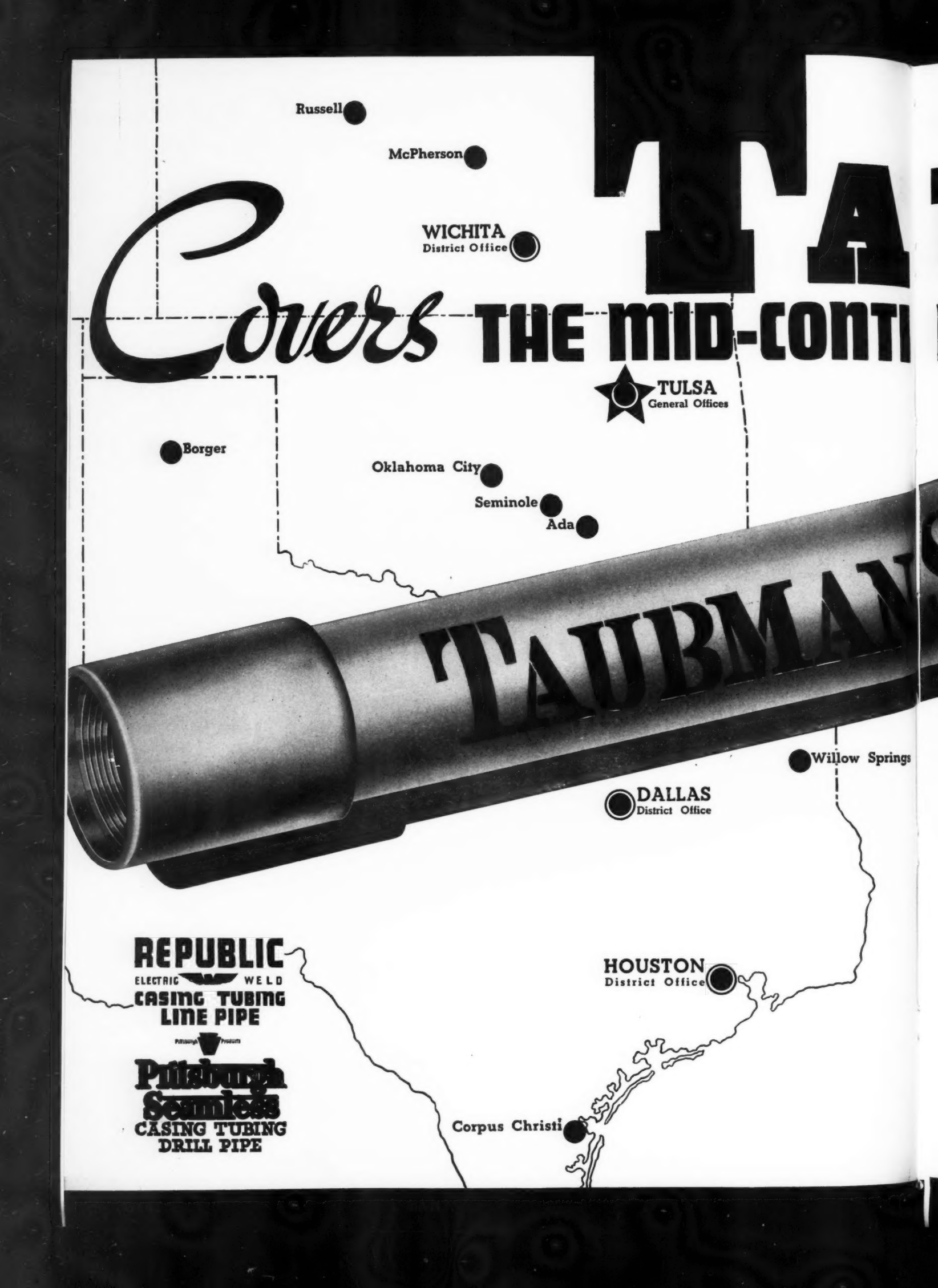


• Republic invites you to view the results of its efforts over a long period of years—years of research, of pioneering, of performance. Visit Booths 16 to 21 at The World's Fair of the Oil Industry, Tulsa, May 16-23. Republic men will be there to give you new ideas—to tell you how Republic's newest products will add years of life to equipment, reduce replacement costs, cut operating costs. A visit to our exhibit will pay big dividends on the cost of your trip. So, welcome, until we have the opportunity to shake your hand in Tulsa.

Republic Steel
CORPORATION
GENERAL OFFICES · · · CLEVELAND, OHIO
ALLOY STEEL DIVISION · · · MASSILLON, OHIO

REPUBLIC
STEEL

When writing Republic Steel Corporation for further information, please address Department PT.


Russell
McPherson
WICHITA
District Office
Covers
THE MID-CONTI
TULSA
General Offices
Borger
Oklahoma City
Seminole
Ada
TAUBMAN
Willow Springs
DALLAS
District Office
REPUBLIC
ELECTRIC WELD
CASING TUBING
LINE PIPE
Pittsburgh Products
Pittsburgh
Seamless
CASING TUBING
DRILL PIPE
HOUSTON
District Office
Corpus Christi

QUALITY – QUANTITY & SERVICE

TAUBMAN

TI NENT AND GULF COAST

N SUPPLY CORPORATION

When the Taubman Supply Corporation was founded in 1920 we concentrated our efforts on the buying and selling of Dependable Used Tubular Products. Shortly after the inception of our Company, the Oil and Gas Fraternity responded so wholeheartedly to the TAUBMAN Policy of doing business, we found it necessary to add New Tubular Products to supply our customers' demands.

Today, although we are employing over a Million Dollars in the Used Material Division, it is only a "Service Unit" in our organization, the majority of our business being the distribution of new pipe. We carry comprehensive stocks of Republic Electricweld and Pittsburgh Seamless at our various branches.

Our faith in the Industry and our obligation to our loyal friends and customers is exemplified by the fact that today TAUBMAN SERVICE is available in every active Mid-Continent field from Kansas to the Gulf Coast and South Texas.

Serving the Gulf Coast and surrounding territory, our Plant at Houston, when completed, will be one of the most modern equipped pipe machine shops and yards of its kind.

With the opening of our new Branch at Corpus Christi, Texas, we have ten Branches, seven of which are equipped with the latest Landis Pipe Threading machines handling Grade "C" and Grade "D" pipe, A.P.I. and standard threads from 1″ to 20″ inclusive, depending upon the maximum size required for each District.

The TAUBMAN personnel is trained to expertly serve the Oil and Gas Industry for its various needs, Tubular Products for all purposes being our specialty.

WATCH FOR OUR IMPORTANT ANNOUNCEMENT ON ADDITIONAL BRANCHES!

YARDS AND MACHINE SHOPS

OKLAHOMA	Tulsa
	Oklahoma City
	Ada
	Seminole
TEXAS	Houston
	Corpus Christi
	Borger
	Willow Springs
KANSAS	McPherson
	Russell

UNION
WIRE ROPE CORP.
BOOTHS 80-131
TEXAS BLDG.
HINDERLITER
TOOL CO.
BOOTH 22-24
TEXAS BLDG.
HINDERLITER
PAT. 1144223
MALONEY
PATENTED
BOLTED
COPPER-STEEL
TANKS
HERCULES
TOOL
TULSA
BOOTH 116 REFINERS
BLDG.

UNION
WIRE
CORP
ROPE
UNION
GASO PUMP
& BURNER CO.
BOOTH 57-58
TEXAS BLDG
RECTOR WELL
EQUIPMENT CO.
BOOTH 21
OKLA. BLDG
HERCULES
TOOL CO.
BOOTH 55-56 • TEXAS BLDG.

W.C. NORRIS
MFTR.
11 ARCADE WAY
FOUR WHEEL
DRIVE AUTO CO.
11
No. 5 Arcade Way
BUCKEYE
TRACTION
DITCHER
CO.
NO 3
PENNSYLVANIA
AVE.

Quality Makes Friends!

No. 915

NORRIS

Bronze Bushed Arc Welded UNDERPULL PUMP JACK

With wire line Horsehead, illustrating direct drive from gear unit and motor, also typical counterbalance application

STRAIGHT LIFT LONG STROKE

ARC WELDED Structural steel frame, self contained with welded beam

PRESSURE GREASE BEARINGS.

BRONZE BUSHED OR PLAIN MACHINED BEARINGS with oil grooves, carry lubricant full length of bearings from large oil reserves.

OIL RETAINERS to hold oil in and keep rain and dust out.

LONG STROKES Adjustable by moving the pull-bar bearing up or down on the plate.

STRAIGHT LIFT is accomplished through an arrangement of link design. Wire line Horsehead is optional at no additional charge.

ADJUSTMENT of the Jack in relation to the well is positively controlled in moving saddle bearings by adjusting screws and by vertical adjustment of diagonal braces by means of their threaded ends.

NORRIS

NORRIS

Adjustable COUNTER BALANCE GA Bronze Bushed Arc Welded STROKE POST

Adjustable, extra strong construction of structural steel and structural steel A Frame. Designed to handle extremely heavy pumping conditions. Equipped with machined steel bearings and pressure lubrication.

The counter-balance weights may be adjusted to balance the difference in the load of one well to offset the load of another well by means of lead screw extending entire length of beam. Note crank.

W. C. NORRIS MANUFACTURER, INC.

GENERAL OFFICES TULSA, OKLAHOMA

BRANCHES: Houston, Kilgore, Texas

EXPORT DEPARTMENT: 277 Broadway, New York City

COOPER-BESSEMER CORP.
No. 8 Skelly Dr.
LELAND
EQUIPMENT Co.
No. 12
SKELLY DRIVE
OKLAHOMA CITY
1321 So. WALKER
PERFORATOR
OPERATED BY
LANE-WELLS CO.
The LANE-WELLS
CO.
No. 5 SKELLY D.

At the INTERNATIONAL PETROLEUM EXPOSITION—Tulsa, May 16-23, 1936—the Hyatt Roller Bearing Exhibit will be in the Texas Building, Spaces 108 and 109. Come see us.

HYATTS are EVERYWHERE

Because these better bearings serve so well and so long in oil field equipment it is to be expected that you will find them everywhere.

In all types of drilling equipment—in pumping units of every description—in haulage service—all over the lot these dependable bearings carry on with the minimum of attention.

Most builders of equipment include Hyatt Roller Bearings as a standard part of their production for your protection. But to play safe before you buy, it pays to look for Hyatts in the specifications—then you know it's right from the start. Hyatt Roller Bearing Company, Newark, Detroit, Chicago, Pittsburgh, San Francisco.

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

OIL WELL
SUPPLY CO.
No. 3 DRAKE DR
OIL WELL
OIL WELL
"OIL

AMERICAN TIGER BRAND

keeps an Eye on Costs

AMERICAN TIGER BRAND WIRE LINES

NO matter where you are — or what job you ask wire lines to do — you'll find that American Tiger Brand Wire Lines will wear longest, will be most dependable and will cost least in the long run.

Our engineers have studied every angle of the problems you're up against and they have designed a type and size of line for every need. Just remember that you can save money with American Tiger Brand Wire Lines.

AMERICAN STEEL & WIRE COMPANY
208 South La Salle Street, Chicago
Empire State Building, New York

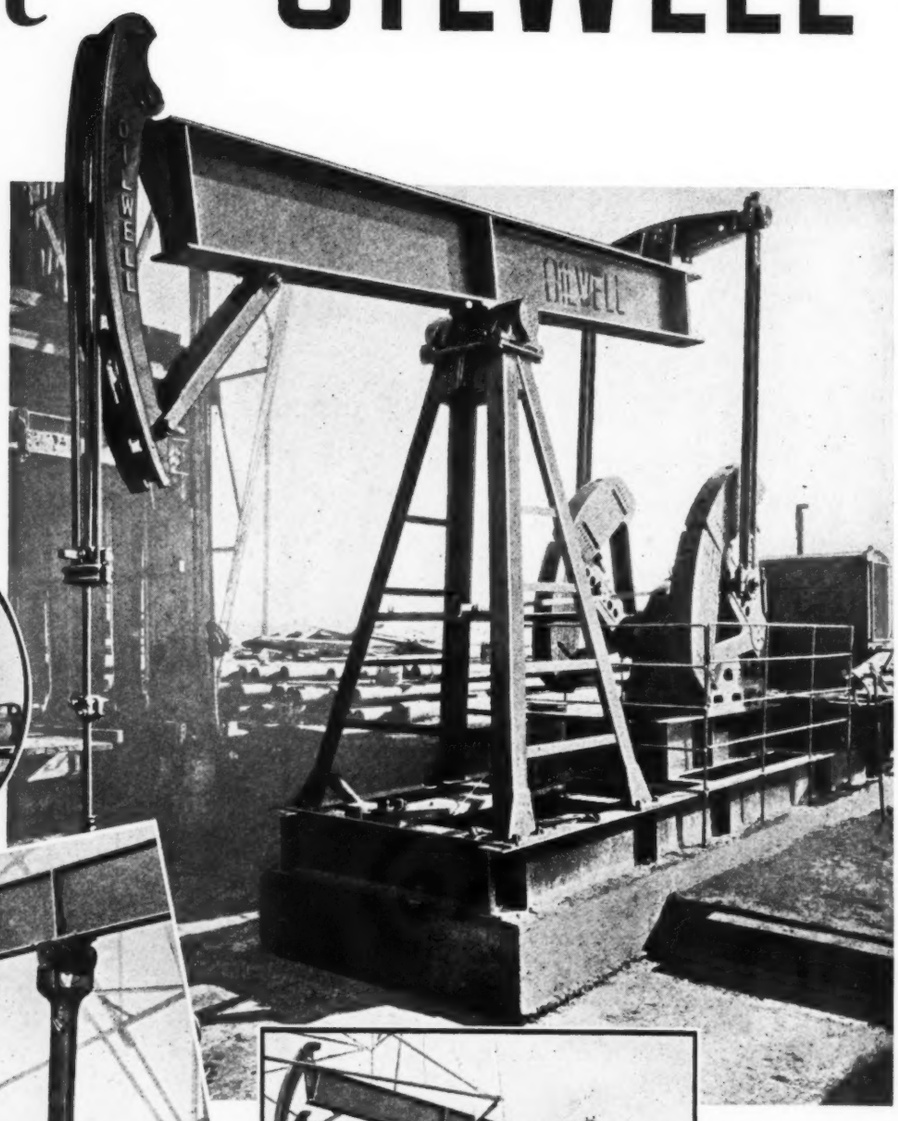
COLUMBIA STEEL COMPANY
Russ Building, San Francisco

United States Steel Products Co., New York, *Export Distributors*

US STEEL

UNITED STATES STEEL

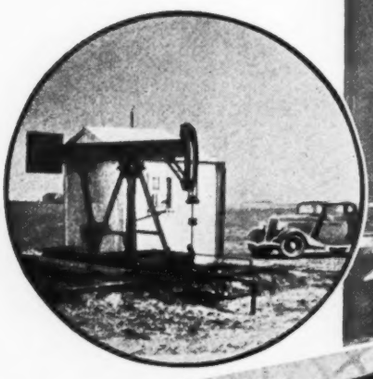
Let "OILWELL"



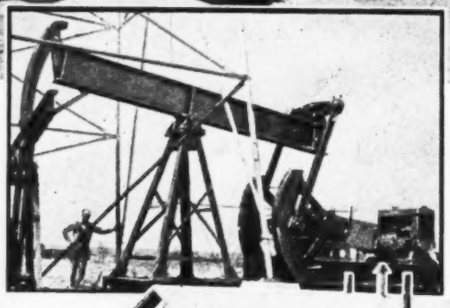
(*Right*) TC-35 "Oilwell" Pumping Unit in California, driven by multi-cylinder engine.

• • •

(*In Circle*) One of seventy No. 10 "Oilwell" Pumping Units in the Cutbank Field in Montana (an "Oilwell" Service Car in the background).



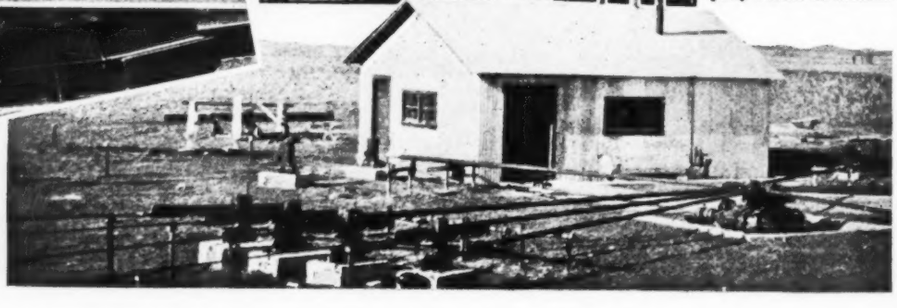
(*Above*) This SC-20 "Oilwell" Pumping Unit has a wheel type crank and back crank arrangement for pumping 3 wells at Gladewater, Texas.



(*Left*) Portable TC-27C "Oilwell" Pumping Unit making a potential production test in Kansas.

• • •

(*Below*) 80-SC "Oilwell" Geared Power on a major producing company's lease in Kansas.

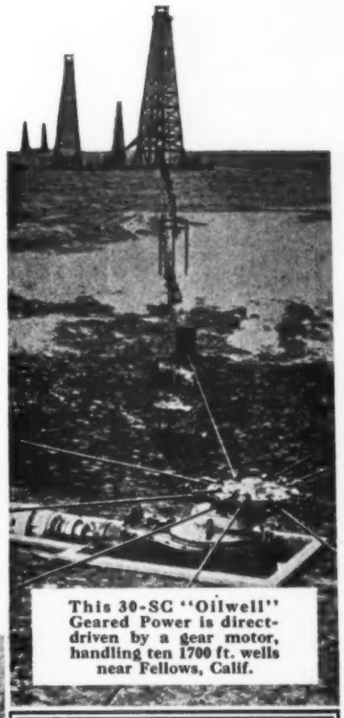


lift your Oil

AFTER seeing the installations shown here and on other pages in this issue, production men will admit that Oil Well Supply Company has the machinery and experience to handle any kind of pumping problem.

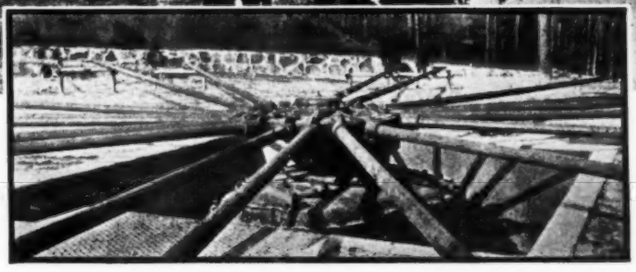
But it's the service behind this equipment that we want you to know about and use. With the "Oilwell" Engineers' experience they have a real service to offer that will help you pump your wells day after day, at low cost, with the greatest recovery per dollar invested. Call on "Oilwell" Engineers to help you get this greater efficiency with "Oilwell" pumping equipment.

• • •



This 30-SC "Oilwell" Geared Power is direct-driven by a gear motor, handling ten 1700 ft. wells near Fellows, Calif.

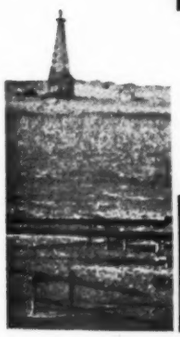
(*Below*) This No. 50 "Oilwell" Geared Power is driven by a Waukesha multi-cylinder engine in the open. No housing cost is incurred.



(*Right*) This 150-SC "Oilwell" Geared Power is hooked up to 18 wells averaging 3500 feet in depth in East Texas.

A NEW SPECIALIZED "OILWELL" SERVICE

Often the same grade of sucker rod will not work efficiently in wells only 100 yards apart. Now "Oilwell's" metallurgically and mechanically trained Sucker Rod Engineers can analyze the many pumping problems and specify the grade of sucker rod you need. They may help you also in selecting pumping jacks, pull rods, surface equipment and other allied equipment. Call on "Oilwell" Sucker Rod Engineers to help you get the greatest possible efficiency in your pumping.



OIL WELL SUPPLY COMPANY

Branch Stores in All Oil Fields

United States Steel USS *Corporation Subsidiary*

"OILWELL"

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ONSIN
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Detroit
MICHIGAN
INDIANA
NATIONAL SEAMLESS
Indianapolis
PENN
OHIO
WEST VIRGI

SEAMLESS

will be used exclusively

IN

THE NEW DETROIT GAS LINE

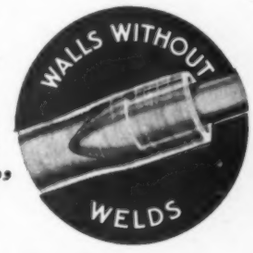
•

The largest pipe line in recent years—230 miles of 22-inch NATIONAL Seamless!

NATIONAL Seamless Pipe links the city of Detroit into the chain of important cities using natural gas. ***Seamless,*** the modern pipe, was chosen for this first big pipe line in recent years because of its outstanding physical characteristics.

NATIONAL Seamless ***has no welds*** —no line of weakness to worry about when strains due to bends, shocks or other severe installation conditions are imposed. Pierced from solid steel—uniform wall strength, transversely and longitudinally, is assured. NATIONAL Seamless is made under the watchful eye of one organization from ***ore to finished product—no divided responsibility.***

For your gas, gasoline or oil lines, investigate fully what NATIONAL Seamless Pipe can do. Let NATIONAL engineers explain to you the full advantages of ***"Walls Without Welds."***



NATIONAL TUBE COMPANY

UNITED STATES STEEL

NEW GUIBERSON ITEMS

you'll see at the Exposition

GUIBERSON
Type "C2"
High Pressure
Oil Saver

TYPE "C2" HIGH PRESSURE OIL SAVER

The new GUIBERSON Type "C2" High Pressure Oil Saver, a large number of which are already in operation, is proving itself to be extremely well suited for tubing and drilling-in of wells *under pressure*, and is recommended for working pressures up to 600 lbs. With the rubbers screwed back this Oil Saver will pass anything up to 10" diameter. It can be equipped with almost any type of adapters.

GUIBERSON
"Medium Type"
Tubing Spider

TUBING SPIDER NOW IN "MEDIUM" TYPE

The GUIBERSON Tubing Spider is now offered in an intermediate weight between the Light and Heavy types. GUIBERSON Pioneered two new and important improvements in this patented spider, (1) the Guide Head for guiding tubing into exact center of the spider's bore, and (2) the balanced handle for easy, semi-automatic, safe handling of the slips. The range of types offered will handle all sizes and weights of tubing.

NEW "TYPE K" GUIBERSON SWAB

This addition to our line of famous GUIBERSON patented flexible-cup swabs is a special design for swabbing tubing, which gives more fluid by-pass area through the swab than does the Type E. This is accomplished by placing the valve at the top. This increase in by-pass area allows the Type K to fall faster through the fluid. Type E cup assemblies, sleeves and thimbles are interchangeable with Type K.

"TYPE G" CONTROL HEAD PACKER

The new "Type G" model of the GUIBERSON Control Head Packer offers 4 improvements in the world's finest packer. These are (1) Dupont Company's "Duprene" in place of rubber—unaffected by oil and gas, proof against sticking, more durable than rubber; (2) 2 narrow rubbers increase certainty of a tight pack; (3) slips operate on dovetail tracks, insuring accurate alignment and operation; (4) this model has increased by-pass space.

GUIBERSON
"Type K"
Swab

GUIBERSON
"Type G"
Control-Head
Packer

See These and Other Guiberson Specialties at
BOOTHS 106-107, TEXAS BUILDING

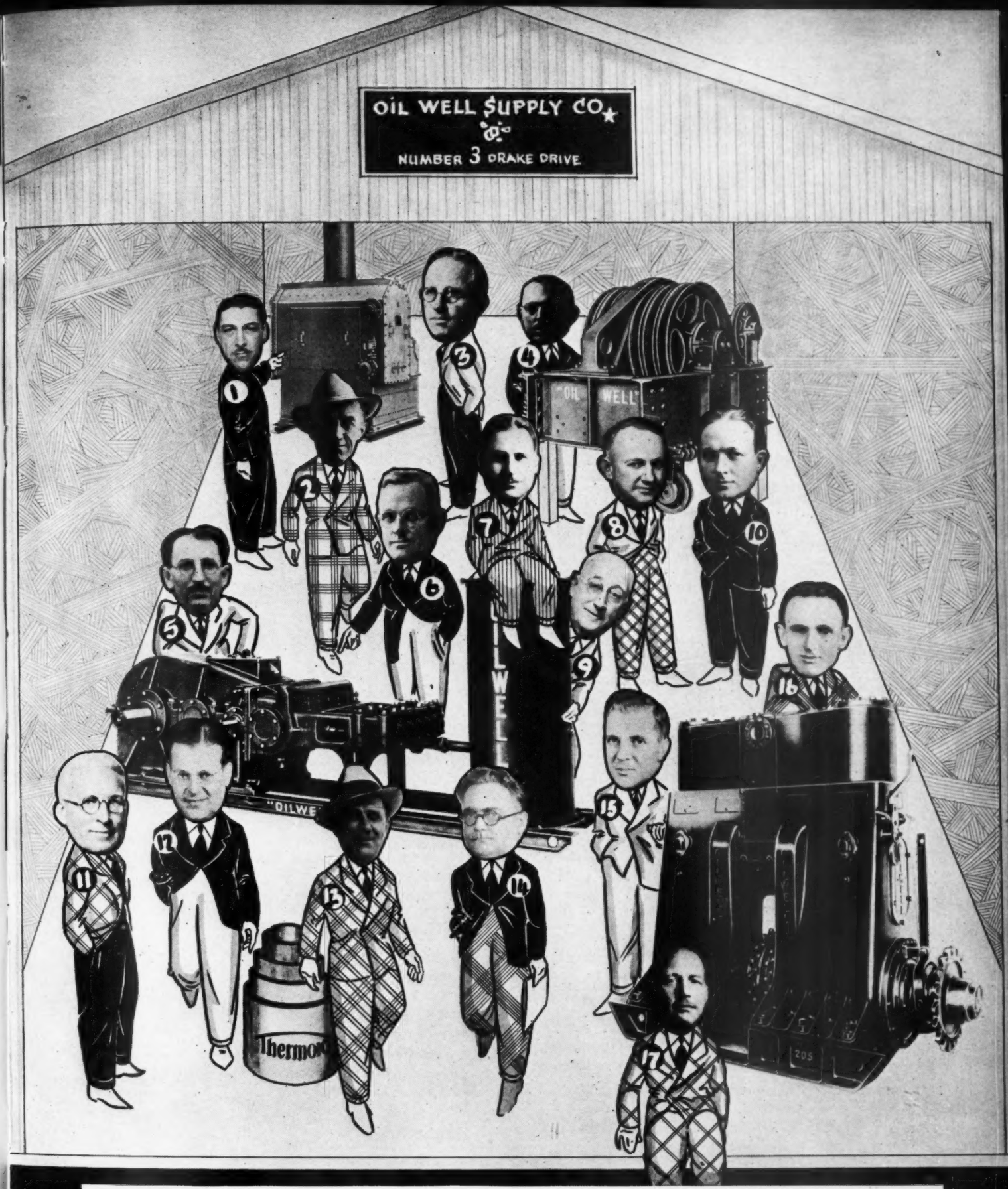
THE GUIBERSON CORPORATION

Box 1106, Dallas, Texas

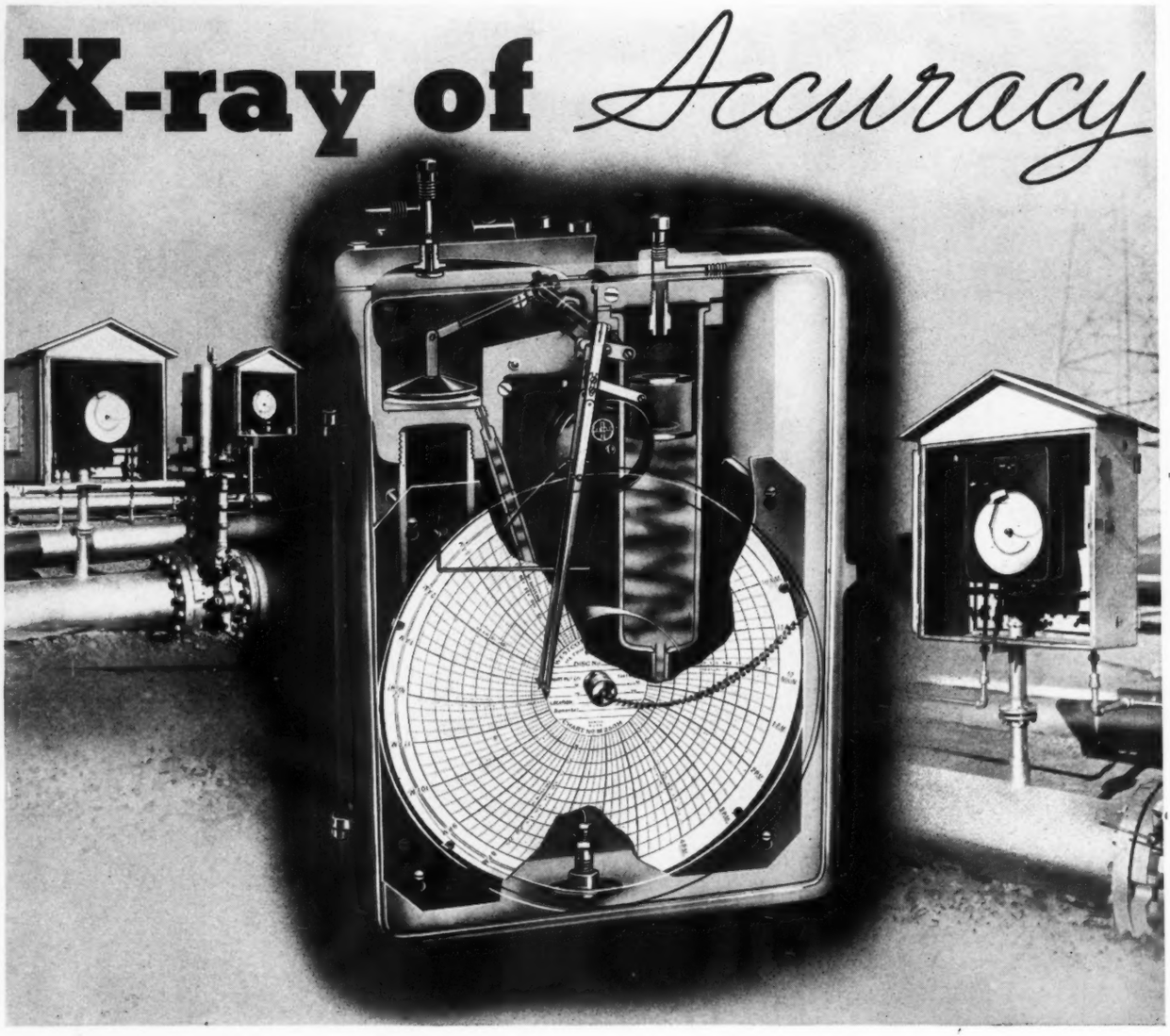
TULSA: 504 Wright Bldg.; HOUSTON: 2241 Hermann Drive; WICHITA, KAN.: 530 S. Fountain St.; NEWARK, O.: First and Locust Sts.; LOS ANGELES: W R. Guiberson Company, 723 E. Gage Ave.

GUIBERSON

BETTER BE SAFE THAN SORRY


OIL WELL SUPPLY CO.
NUMBER 3 DRAKE DRIVE
OIL WELL
OILWELL
205

X-ray of *Accuracy*



EXAMINE WHAT IT IS that makes Westcott orifice meters appeal to the man out in the field . . . the meter engineer who sees the difference between instruments in terms of the number of adjustments and the maintenance necessary to **KEEP** them accurate!

Notice the **SIMPLICITY** of Westcott meters . . . There's only one moving part between the surface of the mercury and the chart record.

Note too the large float area, with wide clearances eliminating loss of accuracy due to dirt collecting on the mercury . . . the low angle of travel of the float . . . and the small angular travel of the static tube. They make the Westcott meter a **PRACTICAL** instrument, insuring not only accuracy but ruggedness and complete reliability.

There are a score of minor refinements as well, all of which come under the heading of good instrument making . . . including accurate machining and honing. Meter men take them for granted in Westcott meters . . . but without them the most advanced features of design still could not produce a Westcott meter.

New literature gives complete data. It will be mailed on request. Also, information on the new popular Round Case Indicating Flowmeter.

AMERICAN METER CO. CENTENNIAL 1836-1936

AMERICAN METER COMPANY
INCORPORATED
Measurement and control of Gas, Oil, Steam, Air and Liquids
ESTABLISHED 1836

METRIC METAL WORKS • ERIE, PENNSYLVANIA

342

ORIFICE METERS . . .
FLOWMETERS . . .
Developed and manufactured to standards of accuracy established in the measurement of volumes as minute as the gas pilot light's flow. Noted for their extreme simplicity of construction, ruggedness, and easy adjustment.
AMERICAN METER CO
MEASUREMENT ENGINEERS
CENTENNIAL
1836-1936
IRONCASE METERS . . .
Body, table, partition, outlet channel and diaphragm channels cast as one unit, eliminating internal leakage . . . Alemite lubrication . . . Dust protection of operating parts . . . Scientific metallurgy . . . Diaphragm quality.
BASE PRESSURE INDEXES . . .
They take the mathematics out of customer relations. No clutches or slippage . . . a mechanism which gives positive integration. The great customer satisfaction derived from this instrument in service is striking testimony of its value.
RELIANCE REGULATORS . . .
Appliance, service and industrial types; noted for their patented exclusive features providing positive lockup, accurate pressure control and greatly reduced upkeep and complaint cost.
AMERICAN METER COMPANY
INCORPORATED
The World's Largest Manufacturers of Gas Meters and Allied Apparatus
ESTABLISHED 1836
METRIC METAL WORKS
PENNSYLVANIA

WESTCOTT & GREIS, INC., DIVISION OF AMERICAN METER COMPANY, INC.

BOOTHS 41, 42, 43 . . . INTERNATIONAL PETROLEUM EXPOSITION . . . TULSA

PROGRESSIVE BRASS MFG. CO. BOOTH 11 TEXAS BLDG
SEISMOGRAPH SERVICE CORP. BOOTH 11 SCIENTIFI TECHNICAL
WELDERS SUPPLY CO. BOOTH 1-2 TEXAS
The OIL WELL IMPROVEMENTS CO. BOOTH 94-116 TEXAS
Ralph N. BRODIE Co Inc BOOTH 8 REFINERS & MARKETERS
MACHINE TOOL AND SUPPLY Co. Booth No. 1-2 ARCADE
WALTER O'BANNON CO. BOOTH 104 TEXAS BLDG.
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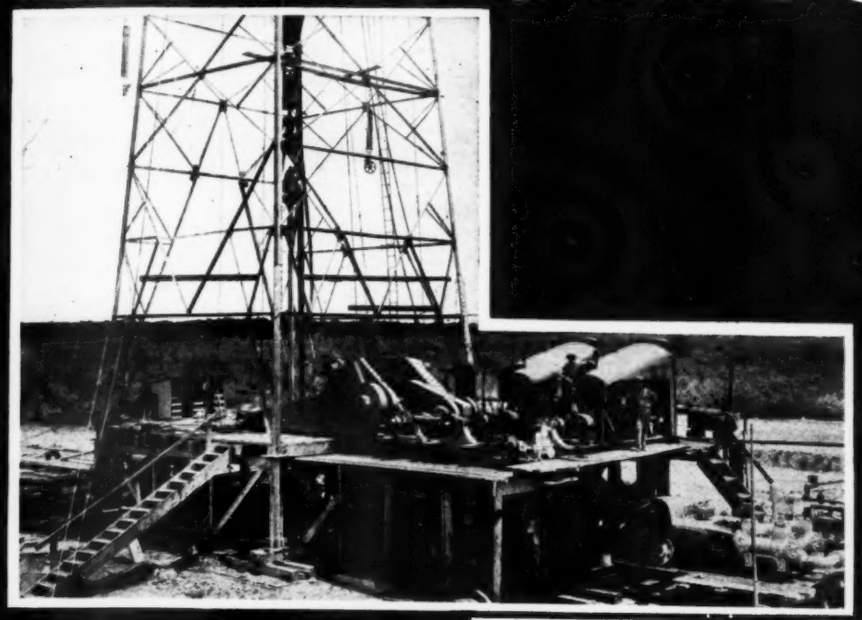
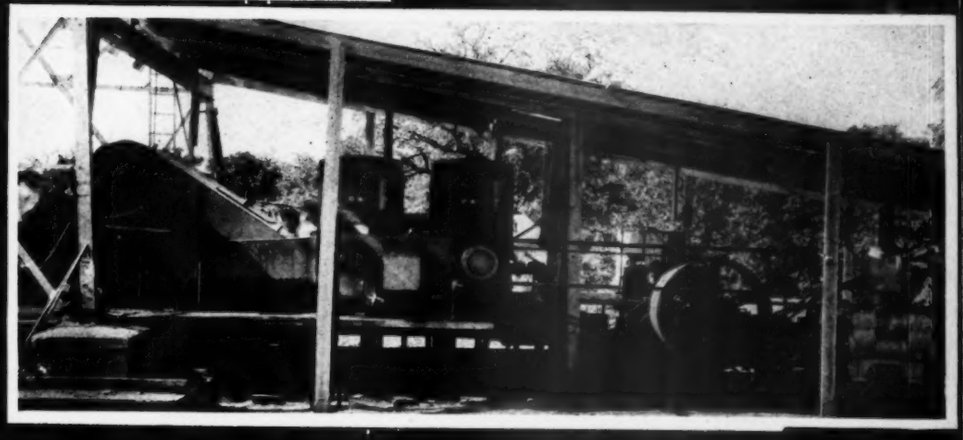
ECONOMICAL





NOW ON DISPLAY . . .

TULSA OIL SHOW

MAY 16-23

POWER / ECONOMY

BUILT FOR

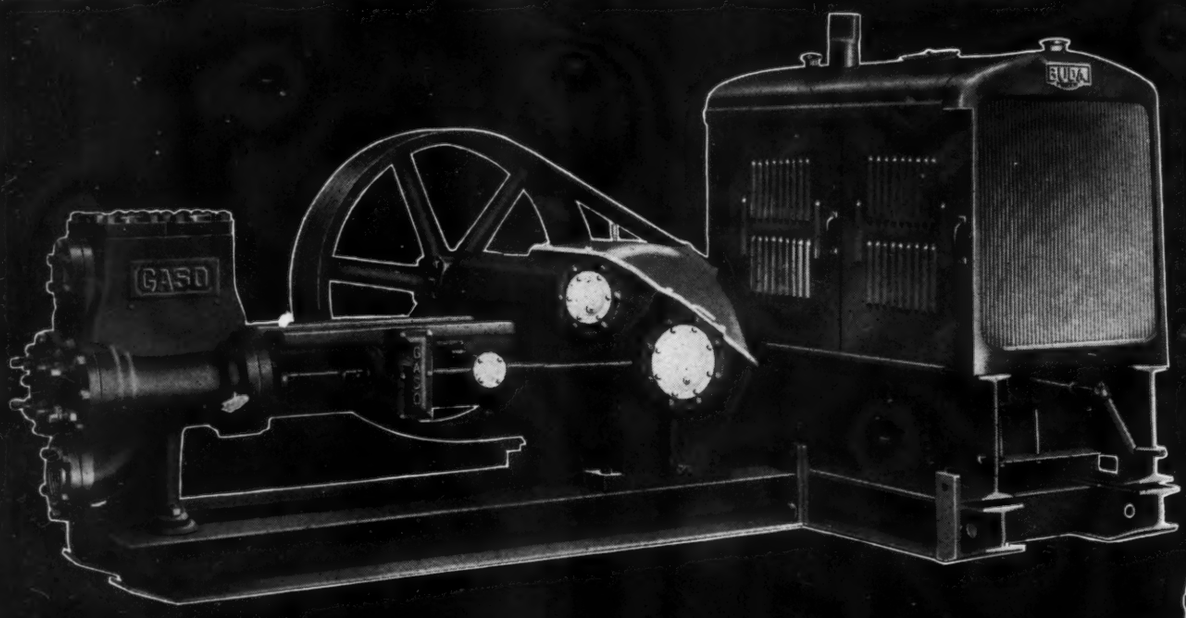


FIG. 1740
Gaso Duplex Piston Pump, Gasoline Engine Drive—54 to 250 Bbls.

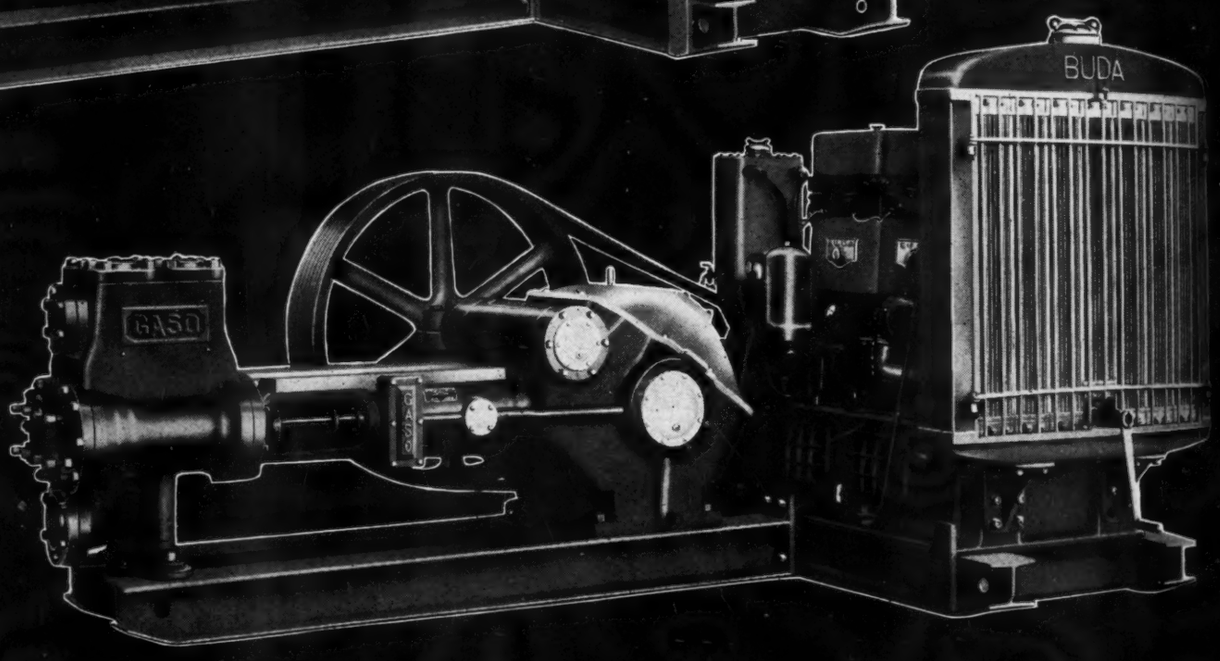


FIG. 1741
Gaso Duplex Piston Pump, Diesel Engine Drive—250 to 502 Bbls.

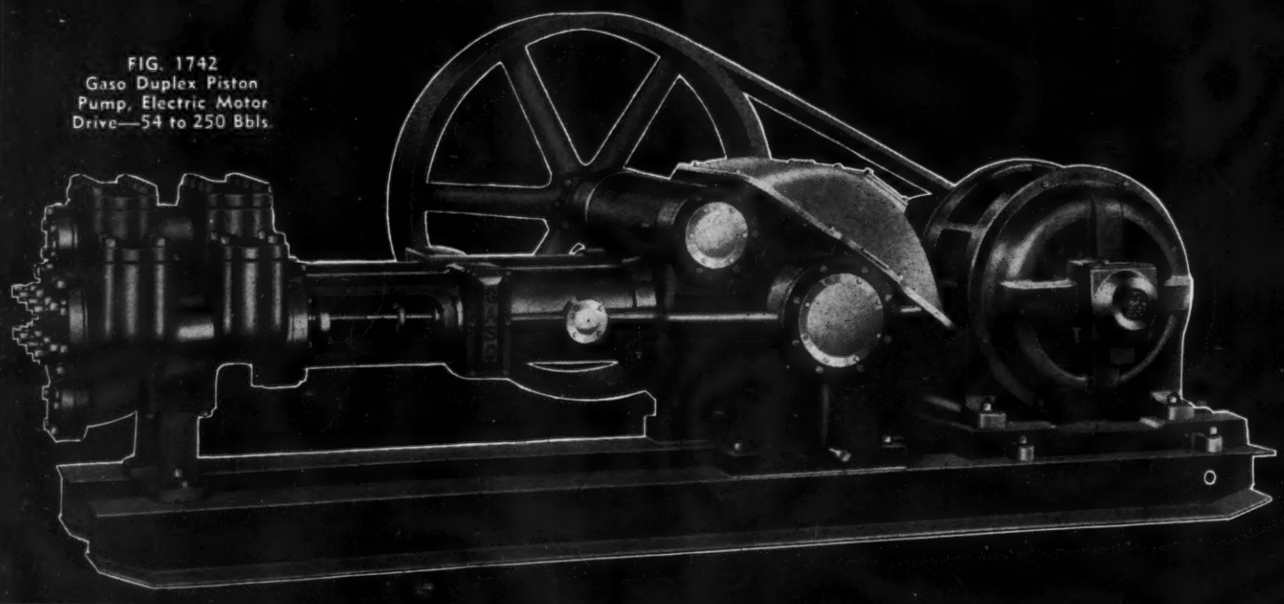
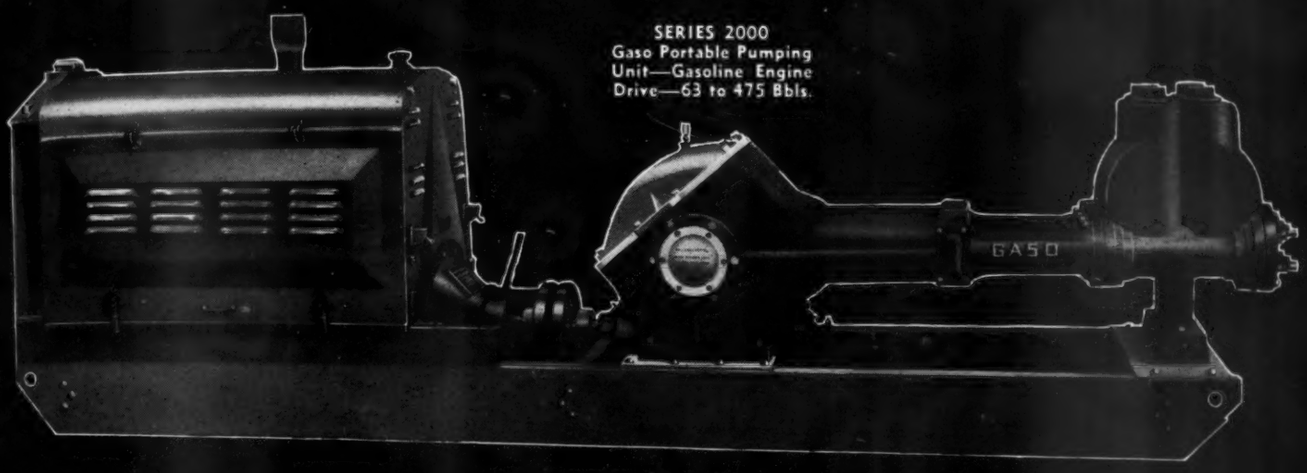


FIG. 1742
Gaso Duplex Piston Pump, Electric Motor Drive—54 to 250 Bbls.

RPIPE LINES



SERIES 2000
Gaso Portable Pumping Unit—Gasoline Engine Drive—63 to 475 Bbls.

FIG. 601
Gaso Walking Beam Pump—30 to 55 Bbls.

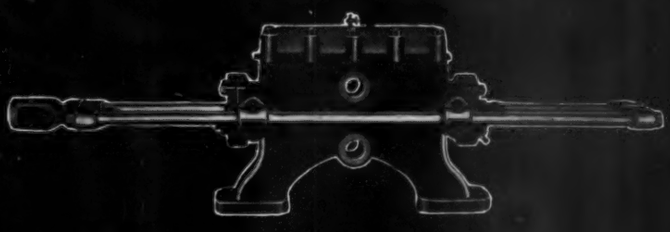


FIG. 301
Gaso Piston Power Pump—32 to 158 Bbls.

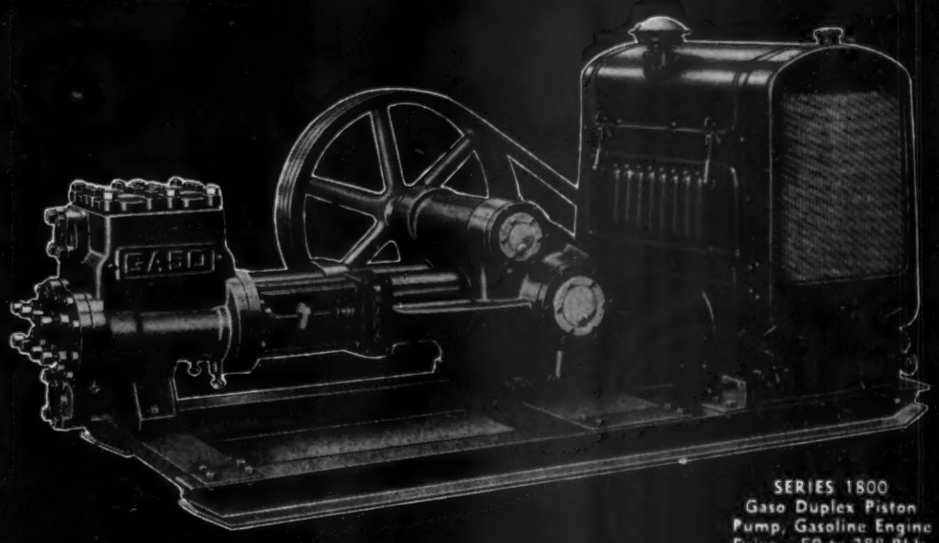
In an age of specialization, GASO has been the one company specializing strictly in the building of pipe line pumps.

For 20 years our engineers have engaged in the constant study of this one field, developing a line of pumps to exactly answer its various requirements.

The producing and pipe line companies have recognized GASO Pumps as especially suited to their needs. In the oil industry throughout the world GASO Pumps have become the main reliance of pipe line operators.

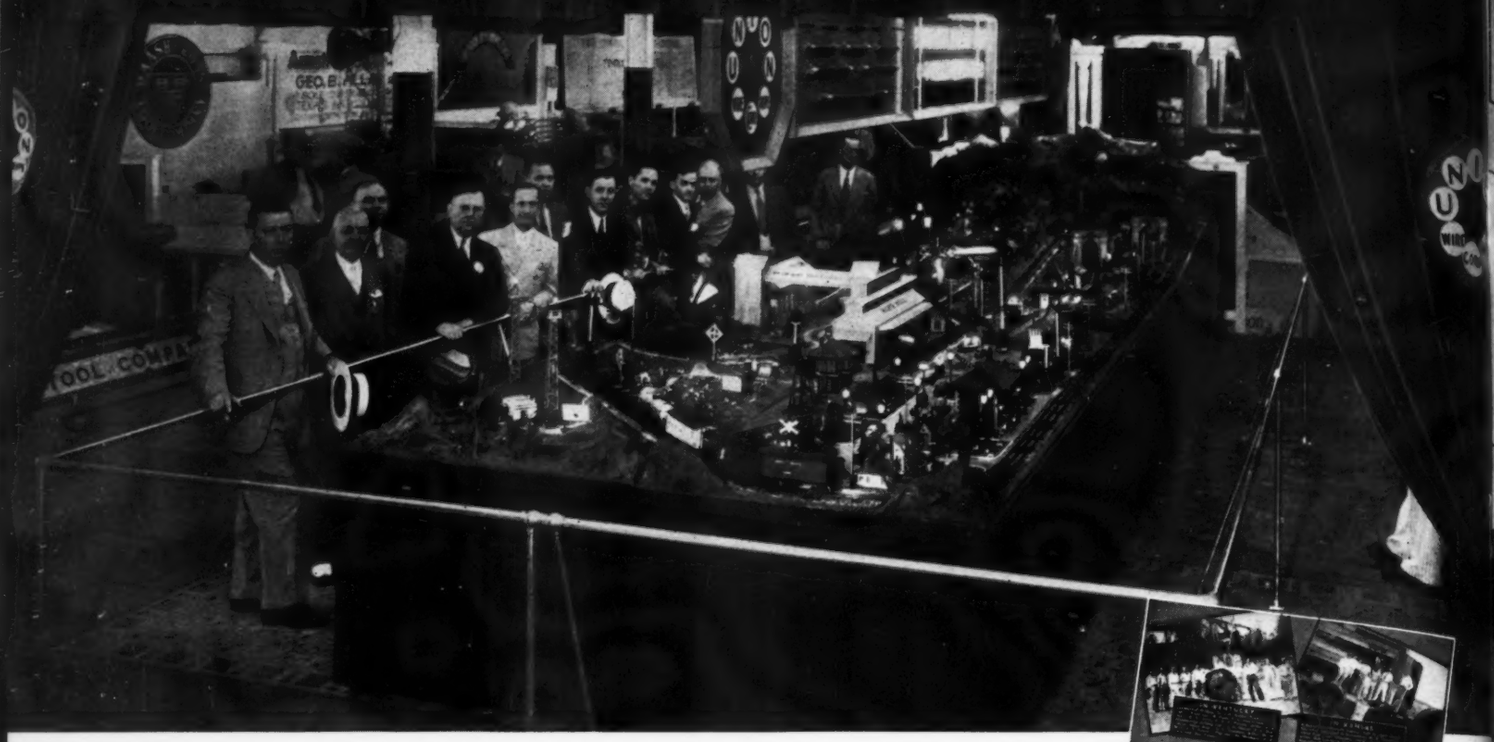
AT THE EXPOSITION
we will exhibit a new GASO Pumping Unit designed for general service but suitable for core drill and seismograph duty. Be sure to see it.
Booths 57-58, Texas Bldg.

GASO PUMP & BURNER MFG. CO.
Tulsa, Okla.
Export Office: 149 Broadway, New York



SERIES 1800
Gaso Duplex Piston Pump, Gasoline Engine Drive—50 to 288 Bbls.

GASO PUMPS



THE WIRE ROPE INDUSTRY IN MINIATURE

Union Wire Rope Corporation extends you a cordial invitation to stop at our Exposition Exhibit, during the show—and get acquainted.

We think you will be interested in seeing our exhibit, depicting the wire rope industry in miniature. The entire operation of the exhibit is automatic, the two trains contacting switches and stops to control their own movements and all loading and unloading operations, through semaphores, switches, gates, etc.

Rods are picked up at the steel plant and delivered to the wire rope plant, and the finished reels of rope are then delivered to the logging, mining and oil industries.

The exhibit was conceived and built by our own mechanical staff at our Kansas City plant.

Don't Fail to Visit Us at
Booths 80 and 130, Texas Building

A Picture Trip thru the Union Plant—
Ask for a Copy

9TH WORLD'S FAIR OF THE OIL INDUSTRY TULSA, U.S.A. MAY 16 TO 23

UNION WIRE ROPE CORPORATION

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P. O. Box 604,
Tampico, Tamps.
Mexico. Stocks
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JARECKI MFG. CO.

Distributors: Midcontinent, New Mexico and Eastern Oil Fields

MARION MACHINE FOUNDRY & SUPPLY CO.,
Rocky Mountain Fields, except New Mexico

Export Agents:
(except Mexico)
LUCEY EXPORT CORP.,
Woolworth Bldg.,
New York; Broad St.
House, London

UNION WIRE LINES

The "ULTIMATE LOW COST WIRE ROPE"

UCC
UNION CARBIDE
COMPANY ★
NO-6-9
California Bldg
HAYNES STELLITE
HAYNES STELLITE
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HASTELLOY
EVERYTHING FOR OXWELDING AND CUTTING
LINDE OXYGEN
Ace-O-Lyn
ACETYLENE
Oxweld
ACETYLENE AND SUPPLIES
UNION CARBIDE
GARLOCK PACKING
COMPANY ★
NO-59-60
TEXAS BUILDING
DAYTON RUBBER
MFG. CO.
No. LA-15
CALIFORNIA BUILDING
AMERICAN HAMMERED
PISTON RING
CO.
NO-85-126
TEXAS BUILDING

"SWIVELNECK" RUMINATES at the OIL SHOW.

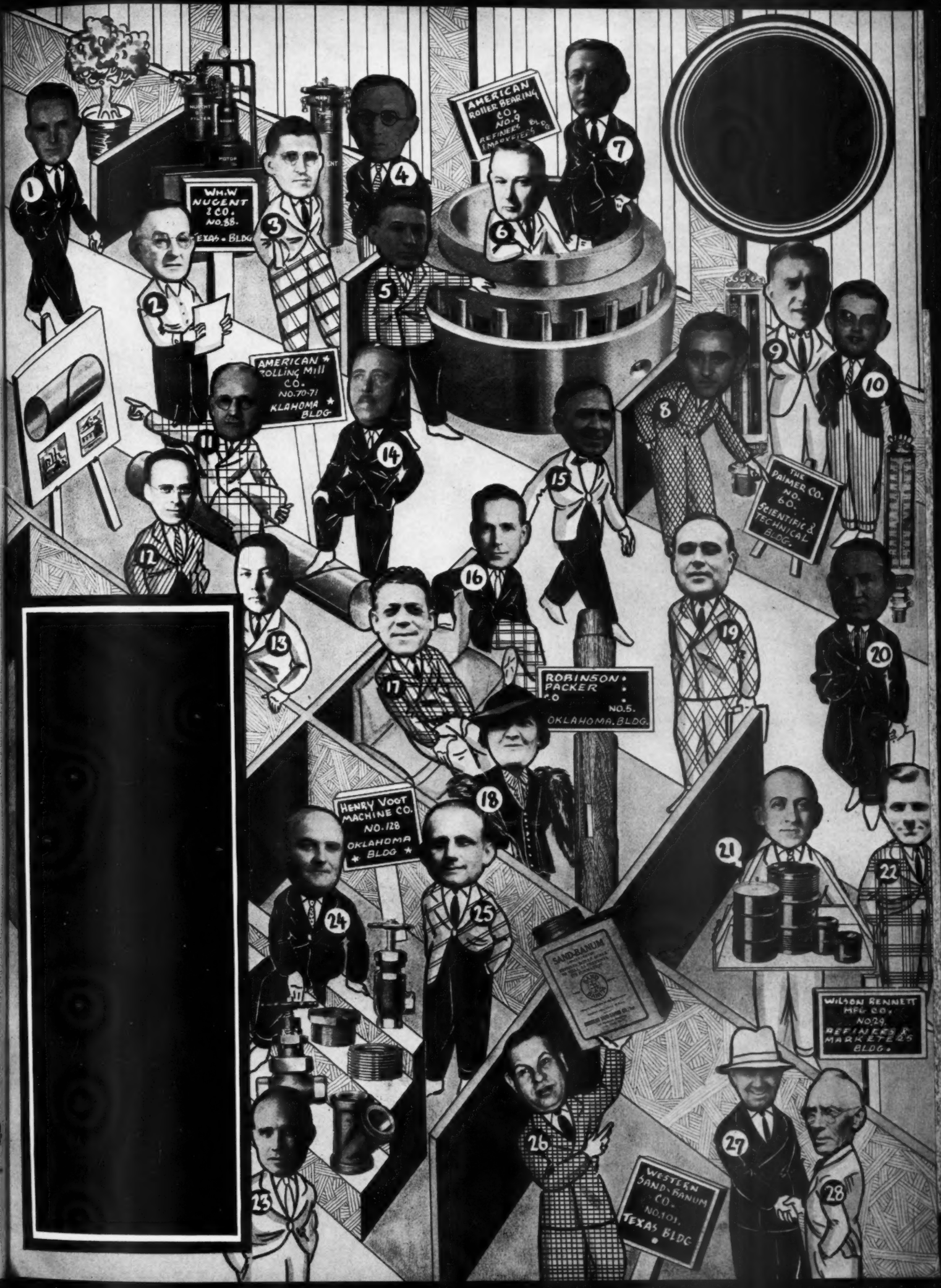
"There's the thing that would 'a' Saved my neck!"

"I wouldn't a had this 'oil bath' neck if I'd had one of them things to drill by. This here neck of mine belongs to the 'B Q' age, when yuh had to be a reg'lar damn' owl to keep track of all the gauges and gadgets on a drillin' rig."

"With one of them there 'Quintuplexes' to drill by, yuh only gotta cast yer eye over her wuncinawile to keep track of how everythin's percolatin'. And yuh don't get caught with yer pants down when sumthin' goes wrong."

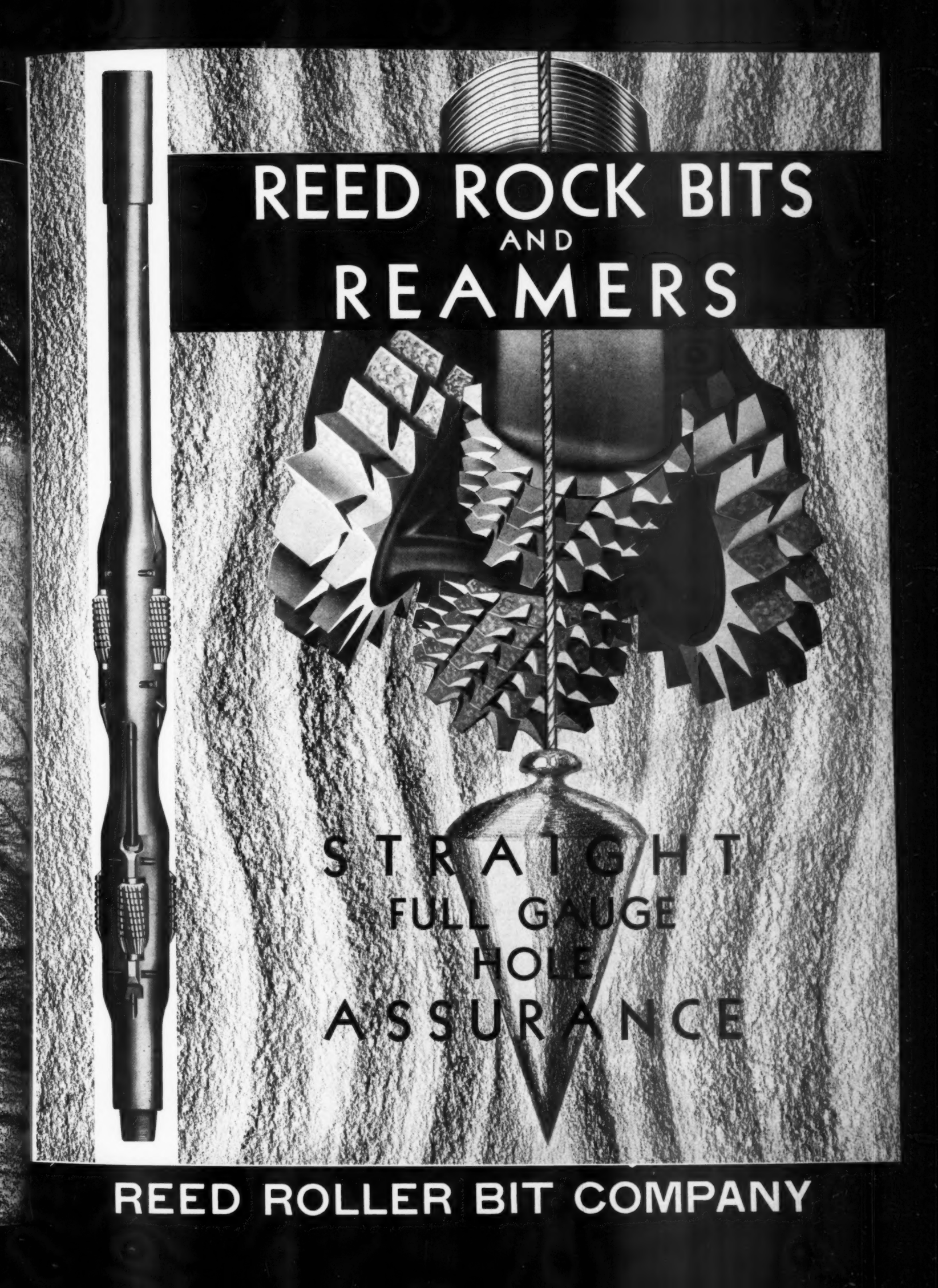
THE WEIGHT INDICATOR
MARTIN DECKER CORP
LONG BEACH CALIFORNIA

San Joaquin Valley: A. F. McQUISTON, Oildale, California
Mid-Continent Distributor: REED ROLLER BIT COMPANY, Houston, Tex


AMERICAN ROLLER BEARING CO. NO. 9 REFINERS BLDG. & MARKETERS
WM. W NUGENT & CO. NO. 88.
AMERICAN ROLLING MILL CO. NO. 70-71 OKLAHOMA BLDG
THE PALMER CO. NO. 60. SCIENTIFIC & TECHNICAL BLDG.
ROBINSON PACKER CO NO. 5. OKLAHOMA BLDG.
HENRY VOGT MACHINE CO. NO. 128 OKLAHOMA BLDG
SAND-RANUM
WILSON BENNETT MFG CO. NO. 29. REFINERS & MARKETERS BLDG.
WESTERN SAND-RANUM CO. NO. 101. TEXAS BLDG

DEPENDABLE

REED
TOOL
JOINTS
FORGED
MACHINED AND
HEAT TREATED
FOR
LONGER
LIFE
WHEREVER THERE IS ROTARY DRILLING


REED ROCK BITS
AND
REAMERS
STRAIGHT
FULL GAUGE
HOLE
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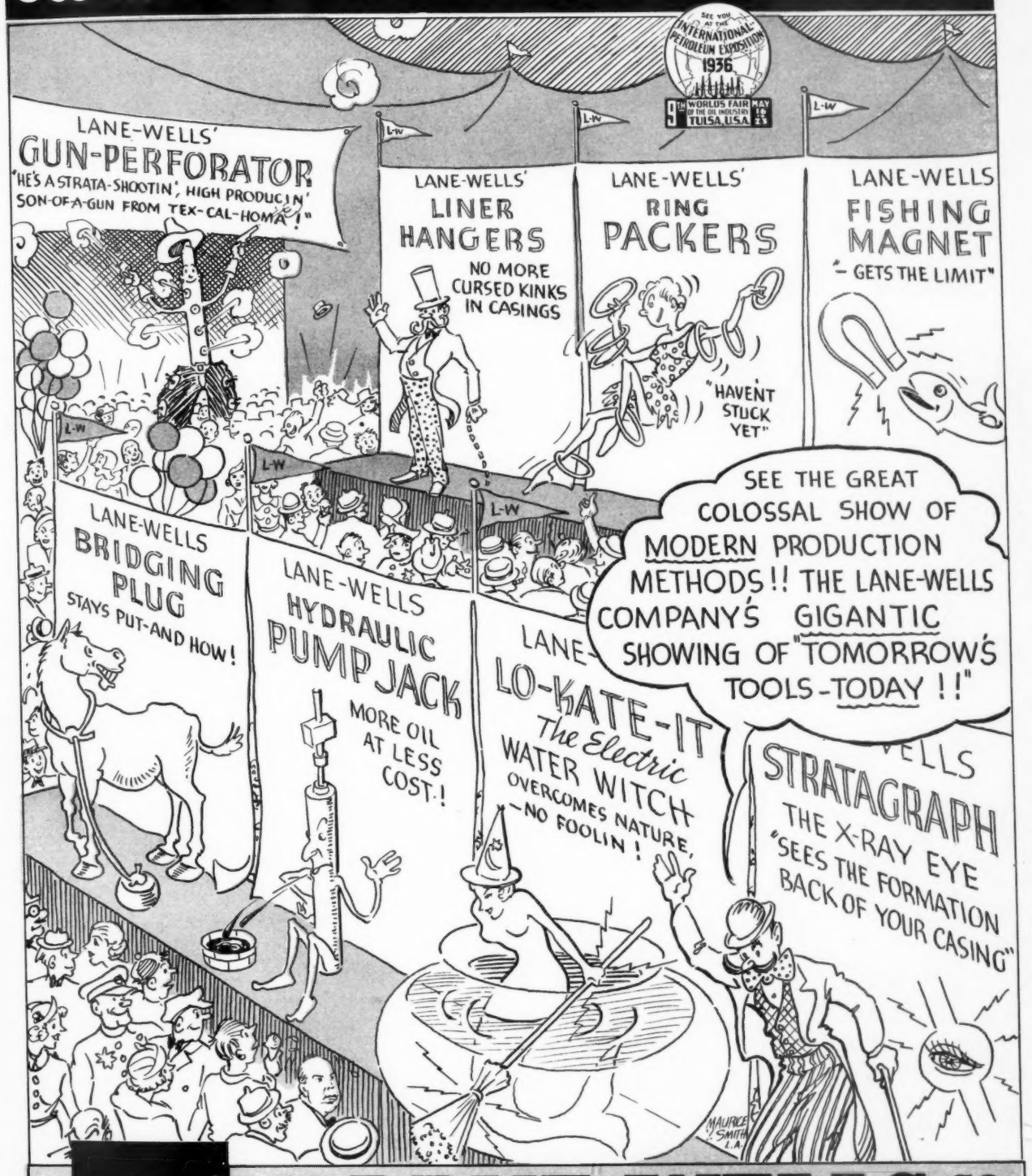
REED ROLLER BIT COMPANY

BIG THREE WELDING EQUIPMENT CO. NO 67-69 OKLAHOMA BLDG.
AMERICAN CHAIN CO. INC. NO.4. OKLAHOMA BLDG.
THE FOXBORO CO. NO.4-6 SCIENTIFIC & TECHNICAL
GAS POWER INC. NO.27. CALIFORNIA BLDG.
TEMPLETON, KENLY & CO. NO.42 TEXAS BLDG

See us at the BIG SHOW! IN TULSA!


SEE YOU AT THE INTERNATIONAL PETROLEUM EXPOSITION 1936
WORLD'S FAIR OF THE OIL INDUSTRY TULSA, U.S.A. MAY 19 TO 23
LANE-WELLS' GUN-PERFORATOR "HE'S A STRATA-SHOOTIN', HIGH PRODUCIN' SON-OF-A-GUN FROM TEX-CAL-HOMA!"
LANE-WELLS' LINER HANGERS NO MORE CURSED KINKS IN CASINGS
LANE-WELLS' RING PACKERS "HAVEN'T STUCK YET"
LANE-WELLS FISHING MAGNET "- GETS THE LIMIT"
SEE THE GREAT COLOSSAL SHOW OF MODERN PRODUCTION METHODS!! THE LANE-WELLS COMPANY'S GIGANTIC SHOWING OF "TOMORROW'S TOOLS-TODAY!!"
LANE-WELLS BRIDGING PLUG STAYS PUT-AND HOW!
LANE-WELLS HYDRAULIC PUMP JACK MORE OIL AT LESS COST!
LANE- LO-KATE-IT The Electric WATER WITCH OVERCOMES NATURE, -NO FOOLIN!
VELLS STRATAGRAPH THE X-RAY EYE "SEES THE FORMATION BACK OF YOUR CASING"
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THE LANE-WELLS CO.

Gun Perforator Service

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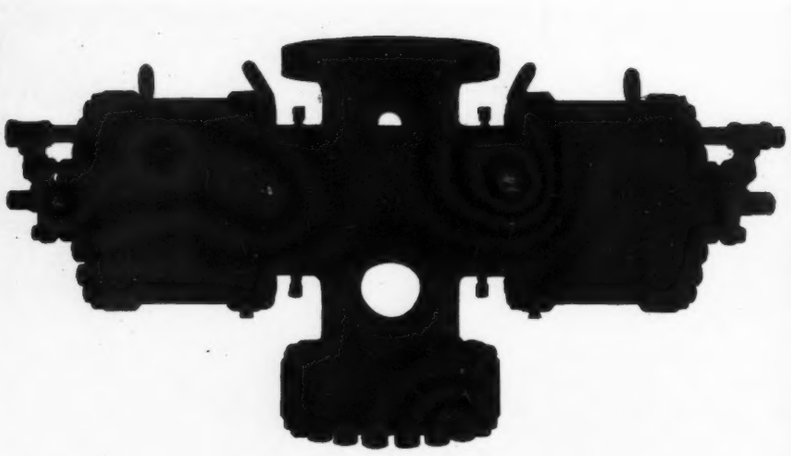
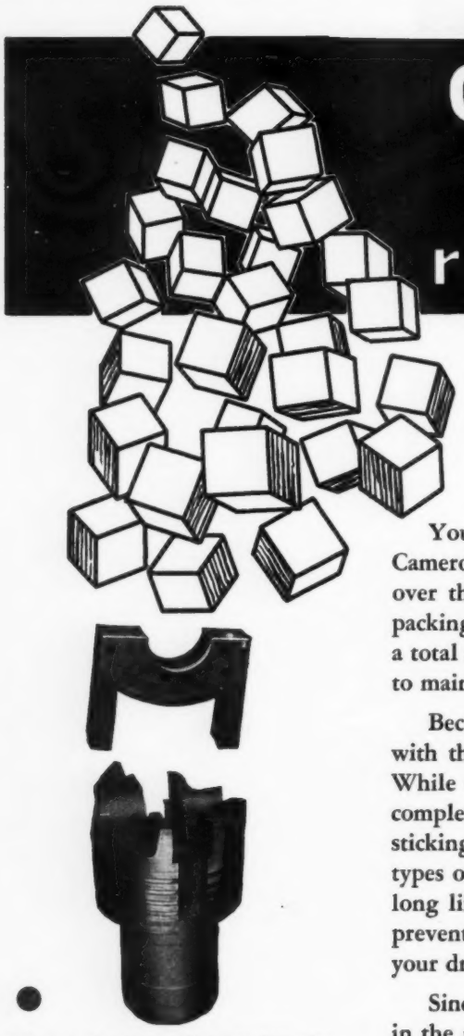
THE LANE-WELLS CO. OF TEXAS • HOUSTON AND CORPUS CHRISTI ● THE LANE-WELLS CO. OF OKLAHOMA • OKLAHOMA CITY AND TULSA

28



CUBIC INCHES OF SELF-FEEDING ram packing in reserve



in this CAMERON 13⅜" type "SDA" blowout preventer

You can wear off 26 cubic inches of packing material from the rams of a Cameron Type "SDA" 13⅜" Blowout Preventer—and still have complete control over the highest well pressure. This is because a reserve of 14 cubic inches of packing is built into each new 13⅜" Cameron Self-Feeding Ram Packing Element, a total of 28 cubic inches . . . and every inch will feed out automatically as needed to maintain a shut-off around your drill pipe.

Because of this revolutionary construction, catching and holding a blowout with this great new preventer is only one of the important things you can do. While circulating to increase the weight of your fluid column you can also, with complete and positive safety, rotate and raise and lower your drill pipe to prevent sticking. This extra and very valuable advantage, not provided by conventional types of preventers, will save you hundreds of dolars in fishing costs during the long life of your Type "SDA" Preventer. With a hook-up of two Type "SDA" preventers (and many such hook-ups are now in daily use!) you can even lubricate your drill pipe back to bottom with complete safety—if necessary to regain control.

Since it costs no more, why not get all the advantages and features of an "SDA" in the next blowout preventer you buy? Full and complete details will gladly be forwarded to any operator on request.

(Above) Cameron self-centering pipe ram, and Cameron Self-Feeding Ram Packing Element, both standard equipment in Type "SDA" Blowout Preventers. Packing Element is a moulded block of Duprene rubber, supported top and bottom by heavy steel retainer plates. When rams are closed, retainer plates in opposing rams contact and packing is then entirely enclosed by steel. Closing pressure forces packing to flow to pipe surface, making a positive, leak-proof shut-off. Wear on packing due to rotation or spudding of drill pipe through closed rams is automatically taken up and a perfect seal maintained constantly.

CAMERON IRON WORKS, Inc.
711 MILBY STREET **HOUSTON, TEXAS**

EXPORT OFFICE: 74 Trinity Place, New York, N. Y.
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TEXAS
BLDG.
REED
ROTARY
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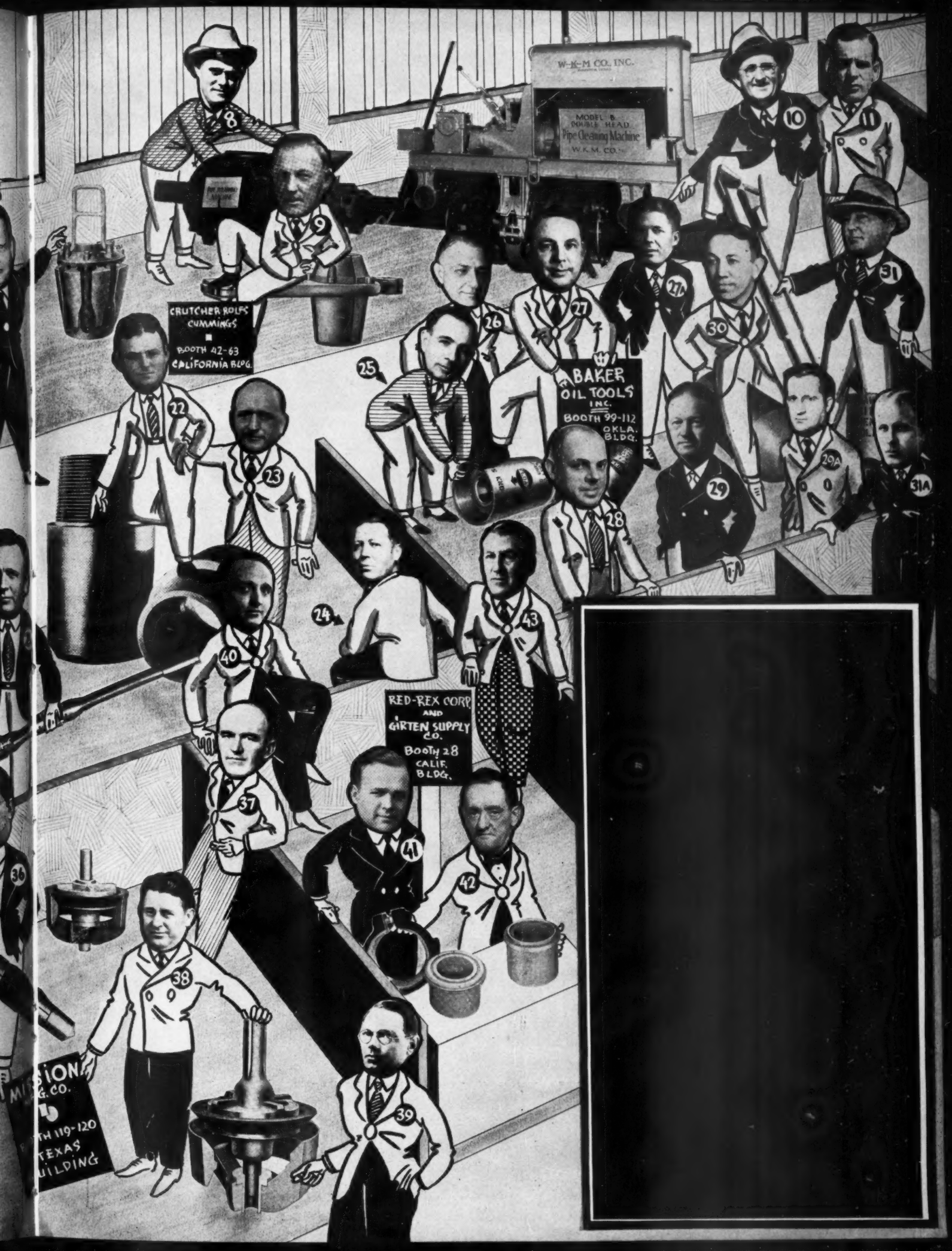
TOOLS
SPEED-ECONOMY


W-K-M CO. INC.
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DOUBLE HEAD
Pipe Cleaning Machine
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IDECO

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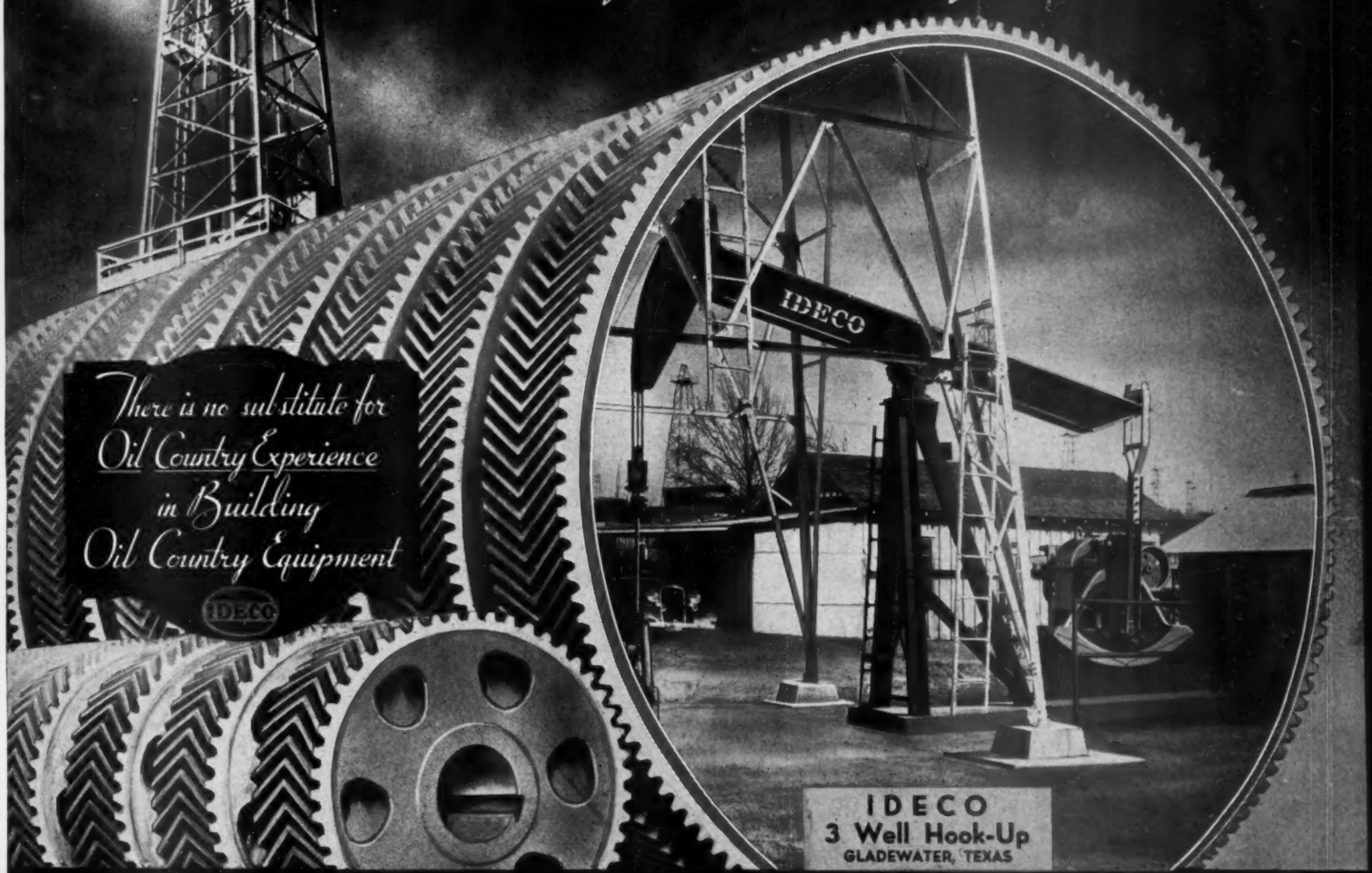
For Every Oil Country Need



There is no substitute for Oil Country Experience in Building Oil Country Equipment

Gears, being the vital part of any pumping machine, IDECO emphasizes quality and precision wherever gears are used. Herringbone gears, cut with utmost accuracy in alloy steel blanks on our latest type Sykes automatic machines, assure quiet operation and long life.

Extra heavy alloy steel heat-treated shafts operate in highest grade bronze bearings (for slow speed shafts) and in high-capacity roller bearings (for high speed shafts.)

A Heavy Fly Wheel assures a steady flow of power to the unit. Every moving part receives continuous and positive lubrication. All units are built in our Connersville shops where heavy machinery of similar type has been produced successfully for more than 50 years.

IDECO Geared Pumping Units were among the first in the field. All of these early units are still in operation, giving excellent service.

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Somewhere CHAPMAN has handled all your VALVE JOBS

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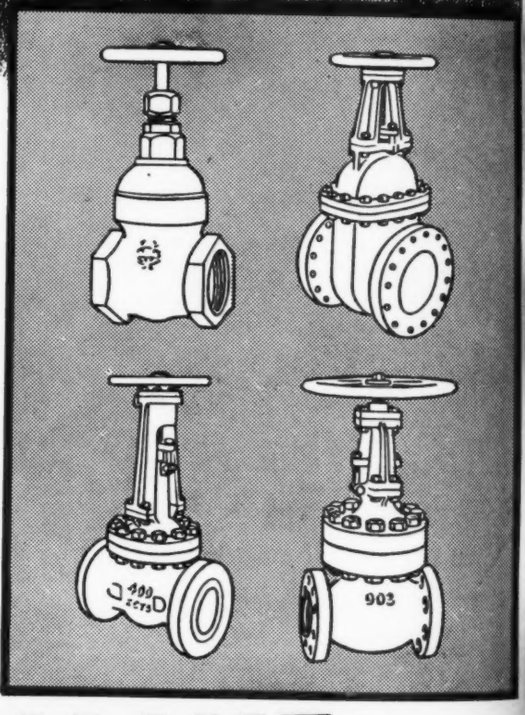

YOU make sure of getting valves already proved on *your* type of service, when you write "Chapman" into your specifications. For there is no valve job in the oil industry, in any part of the world, that Chapman valves have not handled.

Chapman Valves give the kind of service *you* want because their specifications are written as you would write them yourself—out of hard-earned experience in the field. Petroleum engineers have worked with Chapman engineers to develop a line of valves that can be depended on to take on any job, under any conditions — and stay with it, month after month.

This line is so complete that it includes many types, sizes, and materials usually considered special. Gate, globe and check valves, with fittings, in all sizes, for pressures from 150 to 1500 lbs.—temperatures from 50 below to 1500 above.

Stocks are conveniently located. Deliveries are prompt. Talk over your requirements with your supply house — or write to Chapman for full information.

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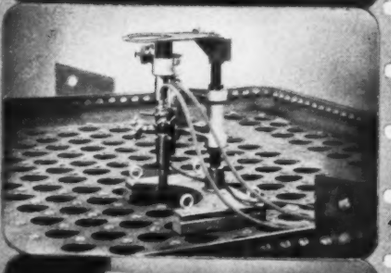
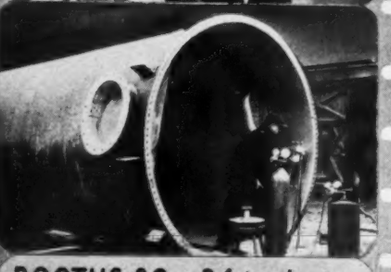
NO. 3.
ARCADE WAY

Make your visit to the TULSA OIL SHOW pay dividends





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SEE

AIRCO'S all-star WELDING and CUTTING SHOW

BOOTHS 30 to 34 Incl. INTERNATIONAL PETROLEUM EXPOSITION, TULSA

featuring actual demonstrations of

PROCESSES, EQUIPMENT and MACHINES

that are saving time, labor *and* money *for Pipe Line Companies, Piping Contractors and Makers of equipment used in the Oil and Gas Industry*

AIRCOWELDING

SEE how easy it is to apply this simpler, faster pipe welding process that has enabled Oil and Gas Companies in all parts of the country to substantially reduce their pipe line construction and maintenance costs.

FIELD WELDING ACCESSORIES

SEE pipe cut and beveled in one operation with the one-man AIRCO-DB PORTABLE PIPE CUTTING and BEVELING MACHINE . . . and watch the testing of welds as it is done in the field with the AIRCO-DB PORTABLE TENSILE and BEND TESTING MACHINE.

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SEE the famous AIRCO-DB TWO-STAGE REDUCTION OXYGEN and ACETYLENE PRESSURE REGULATORS—The safe regulators that save you time and money and automatically maintain a set pressure. Interruptions to work and operating troubles are minimized with better welds as a result.

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SEE the impressive display of AIRCO-DB WELDING and CUTTING APPARATUS and SUPPLIES—a complete line, unexcelled in quality and offering many money-saving advantages in design and performance.

GAS CUTTING MACHINES

SEE the versatile AIRCO-DB GAS CUTTING MACHINES cut simple and intricate shapes out of steel with an ease and speed that no observer can witness without recognizing their great time and labor saving possibilities.

HARD FACING

SEE the simple application of hard-facing material . . . especially Cobalt Borium . . . to drilling tools, by which the durability of bits, core shoes, and fishtails is increased 7 to 10 times, cutting replacement costs and making tremendous savings in time required to pull and change tools.

METAL SPRAYING

SEE how metals and other materials are being effectively protected against corrosion, and disintegration by air, water, gases, chemical fumes, acids, heat, etc., with this economical and practical process.

MEET men thoroughly familiar with these Processes as they apply to Oil and Gas Industry uses, who will be glad to answer your questions and discuss your particular problem.

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AQUAGEL

CONTROLS MUD CAKE THICKNESS ON THE WALLS OF THE HOLE

TESTS conducted under identical conditions of temperature and pressure to those existing in wells of varying depths, have shown that the addition of AQUAGEL to drilling mud has reduced the thickness of mud cake on the walls of the hole as much as 13/16 of an inch. From an operating standpoint, the thinner cake thus built has advantages which are very apparent.

In addition to these advantages, the thin mud sheath represents an actual *saving* amounting to *hundreds of barrels* in the quantity of native drilling mud used in a well of reasonable depth. In other words, mud solids from a large quantity of drilling fluid are required to build this extra mud cake thickness. Besides the many other advantages of a thin, impervious cake such as is provided by AQUAGEL, this *saving* in the cost of an unnecessary quantity of native mud will pay for the greater amount of the cost of the AQUAGEL used. In some cases, where transportation costs from the source of supply are low, complete costs of the AQUAGEL required to reduce cake thickness can be returned out of *savings* on the native mud. Even where transportation costs are higher at points farther removed from the source of manufacture, the *savings* on native mud will pay for a greater part of the AQUAGEL used.

Thick mud cakes, in addition to increasing the hazard of stuck tools and casing, indicate that considerable water has gone into the formation. This fact in itself frequently causes trouble, and very often formations which are generally very difficult to drill through can be successfully and easily penetrated when the water is kept out of the formation. AQUAGEL also minimizes the abrasive qualities of sand in drilling mud, and its unusual lubricating characteristics prevent wear on moving parts. Due to the gel-forming ability of AQUAGEL, cuttings are readily brought to the surface.

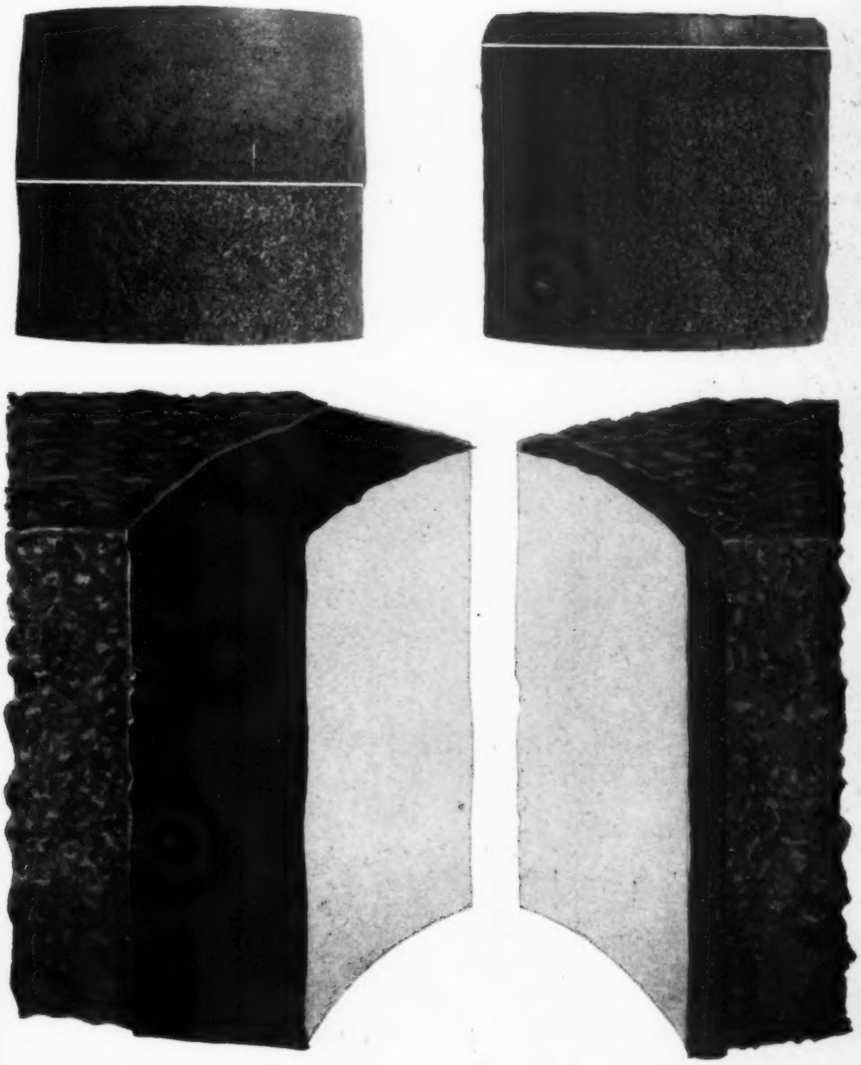
AQUAGEL helps prevent many drilling difficulties. Use it for *best results!*

BAROID PRODUCTS

WHICH DO YOU PREFER?

Thick filter cake (shown above white line) built up in Filter Press test by mud containing no AQUAGEL.

Thin filter cake (shown above white line) deposited in Filter Press test by mud containing a small percentage of AQUAGEL.



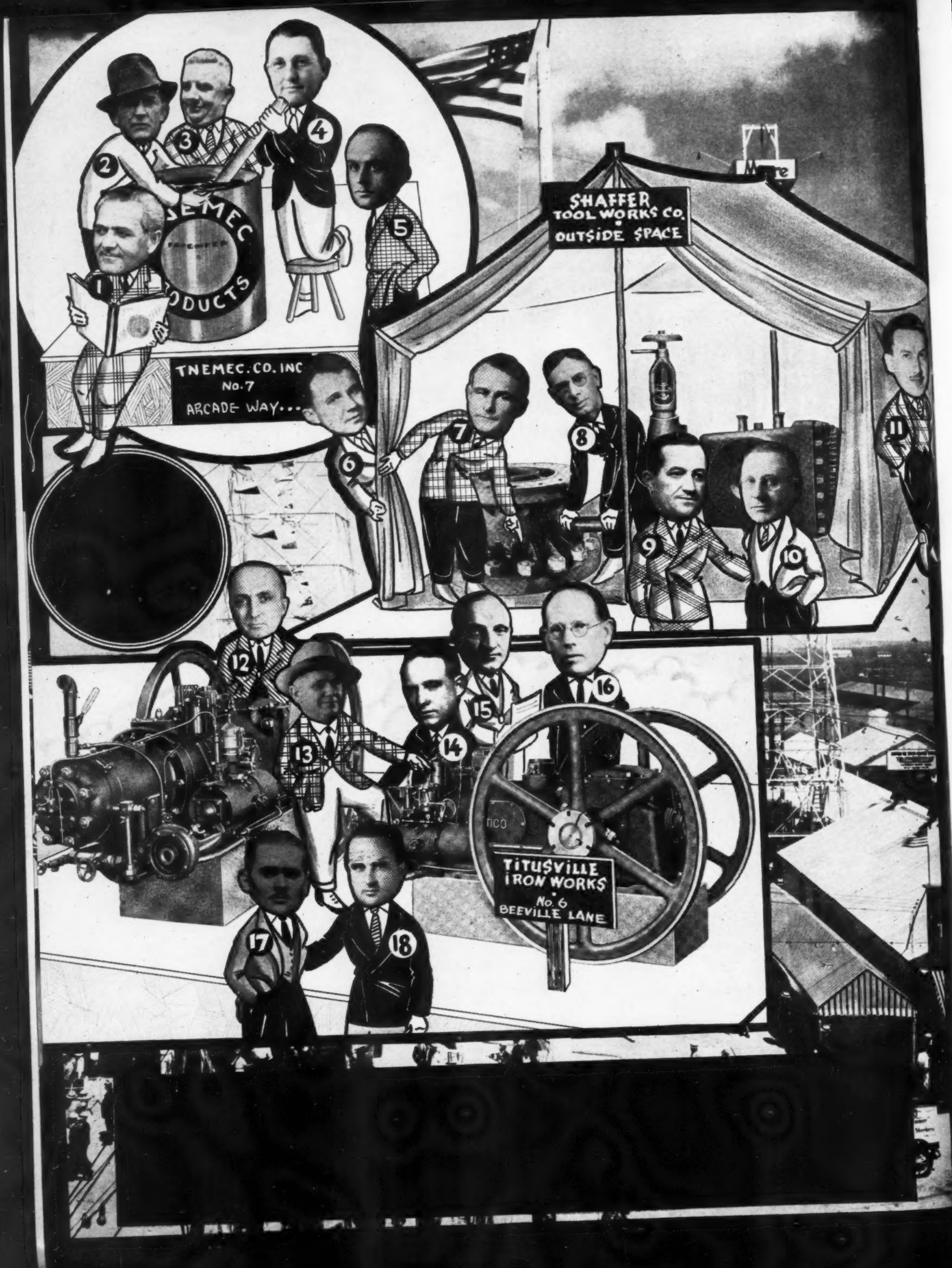
Muds lacking sufficient quantities of colloidal material build thick walls in the hole, increasing the hazards of landing casing and helping to cause stuck tools.

Muds having the proper percentage of AQUAGEL produce thin, impervious cakes which decrease drilling troubles and *increase savings* because less native mud is required.

BAROID SALES COMPANY

LOS ANGELES • TULSA • HOUSTON

NATIONAL PIGMENTS & CHEMICAL COMPANY, ST. LOUIS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TOOL WORKS CO.
OUTSIDE SPACE
TNEMEC. CO. INC
No. 7
ARCADE WAY...
TITUSVILLE
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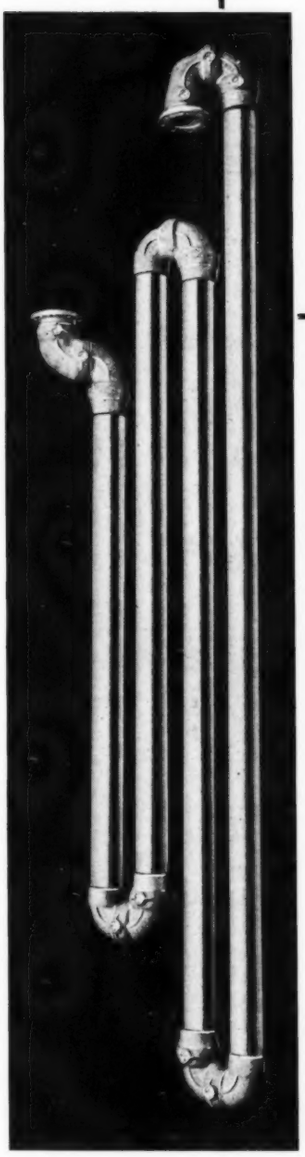
BEEVILLE LANE

Chiksan Joints give unsurpassed service for ship loading, discharging and loading racks. Manufactured in 6 different styles. Sizes up to 8-in. carried in stock. Larger sizes on order.

Our engineers will be glad to submit information and designs covering particular problems wherein the use of flexible joints is indicated.



Aluminum
CROWNS A NEW KING AMONG THE DOCK HOSES

New and useful aluminum alloys have opened the doors of industry to this lighter metal. **Now** Chiksan gives you the first Aluminum Dock Hose, Joints and Dock Risers.

- Heat Treated.
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- 500 pounds safe working pressure.
- Capable of handling all petroleum products.
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- Swivel parts rotate on double row ball bearings.
- Alemite lubrication.

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ALL STEEL ROTARY HOSE—The hose with a positive safety factor. Full 4-in. fluid passage. Safe, Flexible, Economical.

ALL STEEL CEMENT HOSE—Chiksan Joints are standard equipment with leading cement companies.

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HEAVY DUTY REAMER—Unusually long rollers insure maximum cutting. Herringbone cut teeth eliminate tracking.

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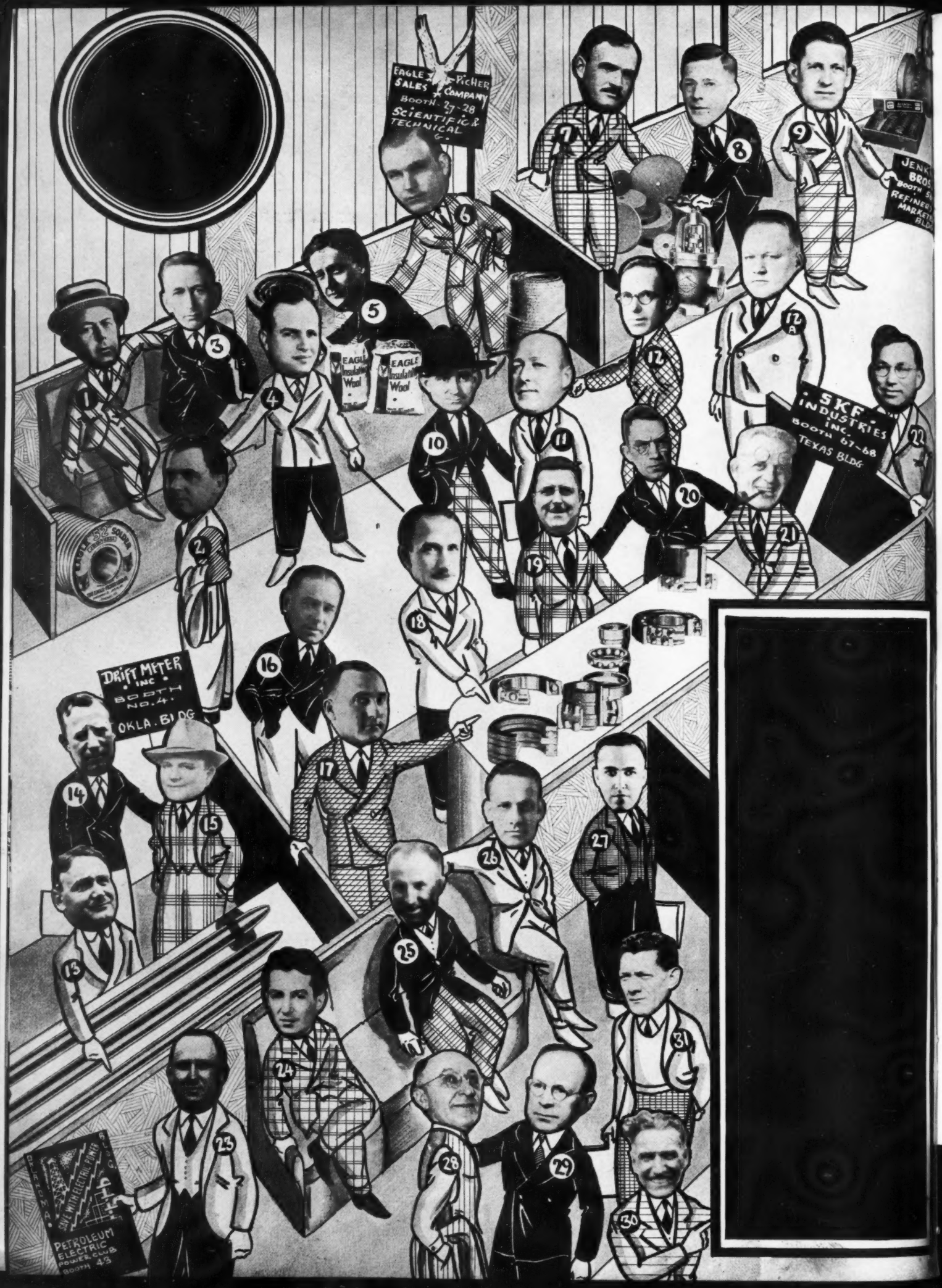
EAGLE-PICHER SALES COMPANY
BOOTH 27-28
SCIENTIFIC & TECHNICAL G.
EAGLE Insulating Wool
EAGLE Insulating Wool
SKF INDUSTRIES INC.
BOOTH 67-68
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Flanged O'Trees

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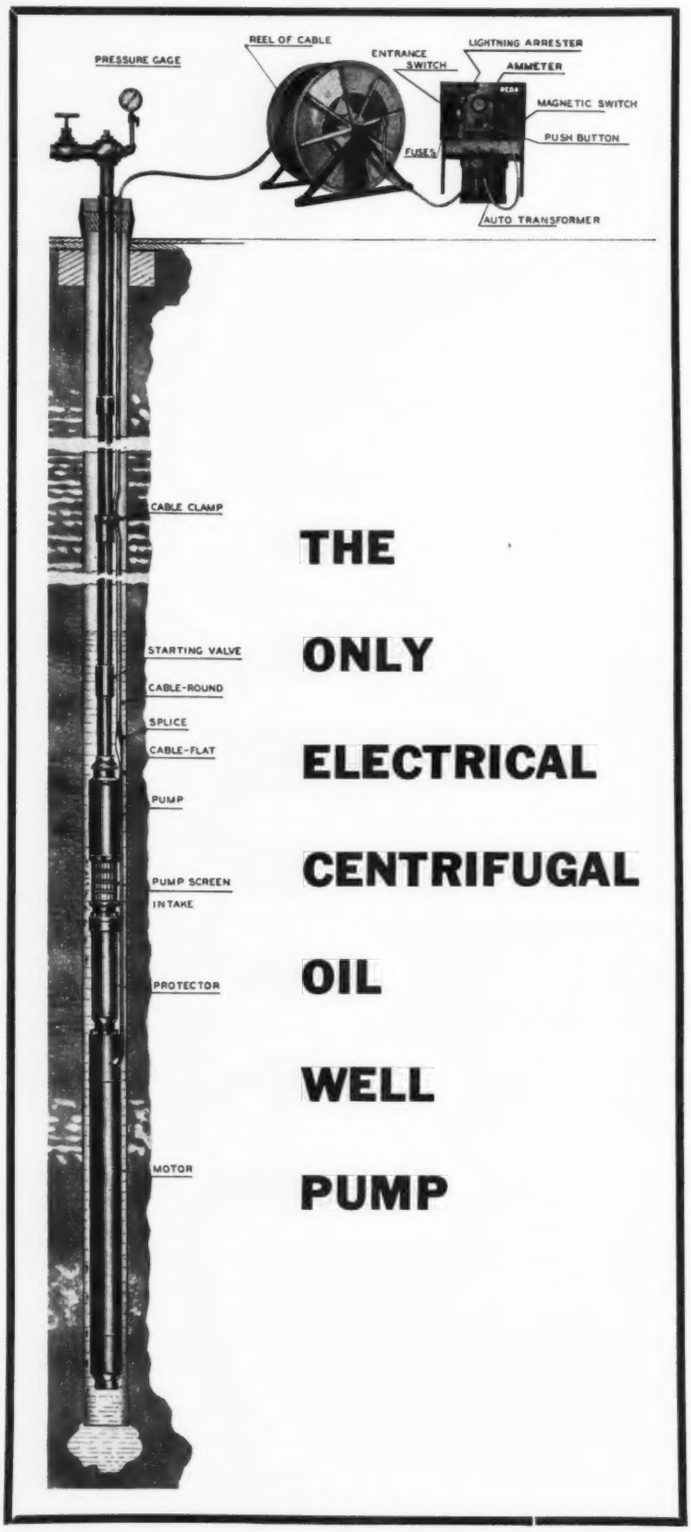
The O. C. T. Type C-F Flanged Streamline Christmas-tree is the most compact and rigid surface hook-up with five control valves on the market today. No threads are exposed to pressure when the valves are closed. Steel seat rings form a seal between all flanges. The complete 'tree is installed while cement is setting on the oil string.

Two Type C-3 Bradenheads inclose inner casing strings. The only threads on these Bradenheads screw into surface casing. The Bradenheads permit swinging of pipe before cementing. Blowout preventer and 7" drilling gate are installed on top of the 'tree for drilling in and running tubing. The tubing hanger is designed to pass through 7" drilling gate and 7" blowout preventer.

We Make Everything but the Valves, which You Specify

REDA



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For Economical Pumping

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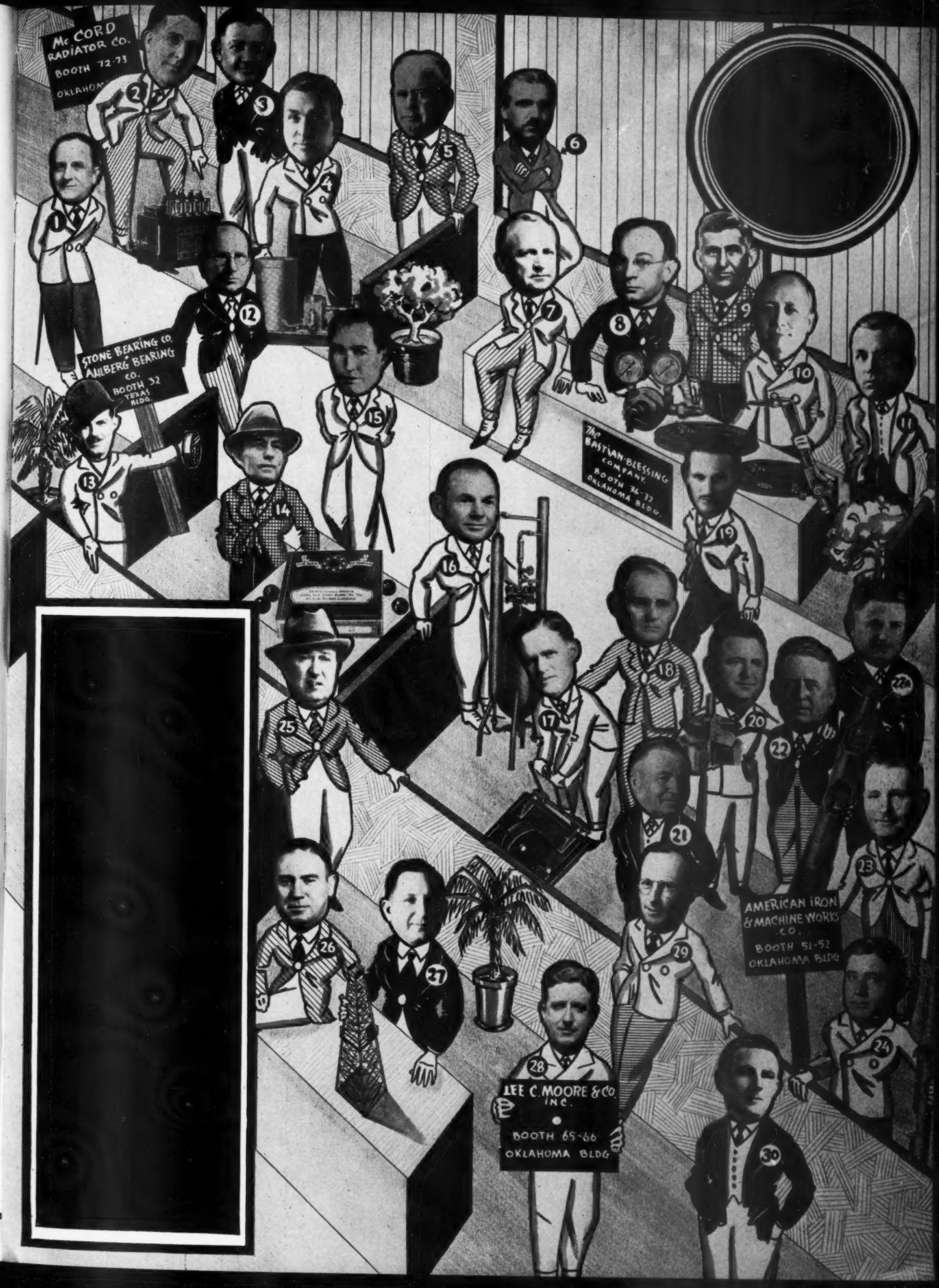
McCORD RADIATOR CO.
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STONE BEARING CO.
AHLBERG BEARING CO.
BOOTH 32
TEXAS BLDG.
THE BASTIAN-BLESSING COMPANY
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OKLAHOMA BLDG.
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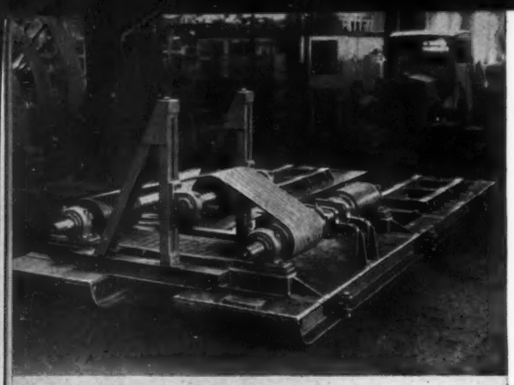
TEE

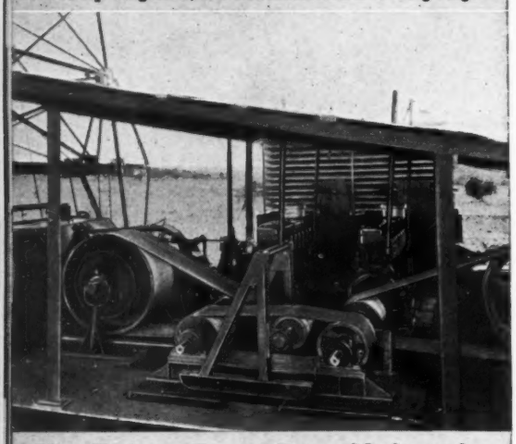
Drilling Rigs to Suit Varied Requirements



Engine Bases, Texrope Drives and Tightener for 240 hp engines, for Mechanical Drilling Rig.

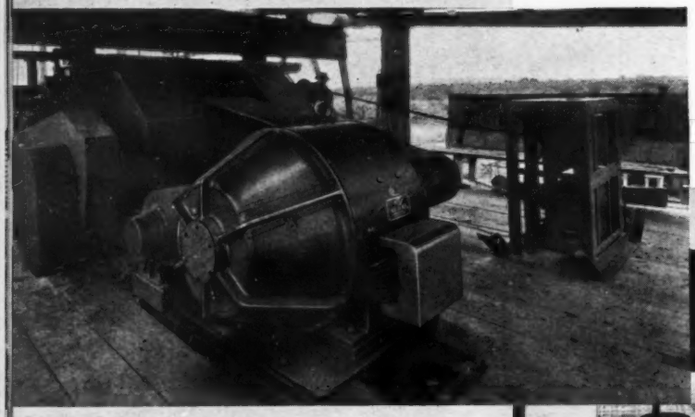
● Texrope drives have proved their dependability to transmit power economically under severe operating conditions. They have made possible new combinations of equipment for drilling and for pumping. Their flexibility and short centers have permitted close coupling of the various units, such as motor to drawworks or slush pump or motors and engines to generators. Texropes cushion the shock, will not slip and require little care.

● One of the mechanical combinations using Texrope drives is shown below. Two 200-hp engines are driving a rotary drilling rig through Texrope Drives. This conventional hook-up allows compounding of engines for hoisting, individual operation of pumps and table, or operation of both pump and table by either engine.



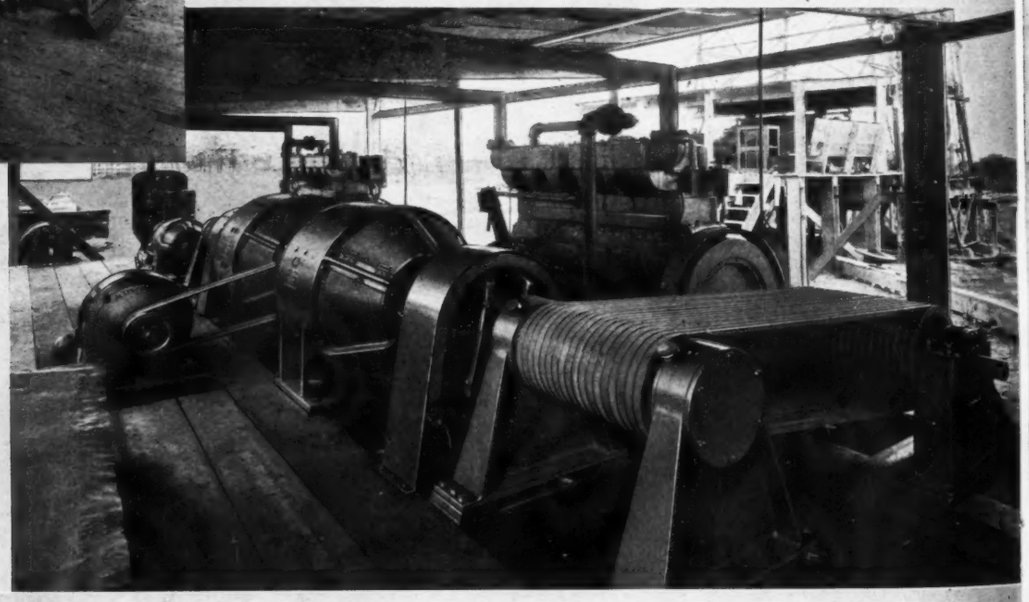
Allis-Chalmers Texrope Driven Mechanical Rotary Drilling Rig.

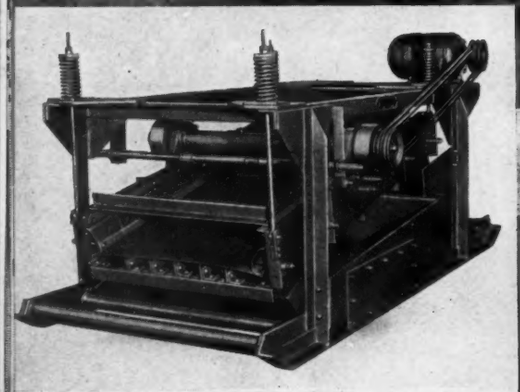
● Allis-Chalmers pioneered in the development of heavy duty d-c rotary drilling equipment, building engine driven units either direct connected or belted to the generator. General advantages are: Flexibility of control, non-stalling of engines, ease of rigging-up; reliability; protection against excessive shock; economy in fuel and water. Exclusive features of Allis-Chalmers d-c rigs are: Single engine operations; self-contained blowers; separately driven exciters; and electric starting for engines where desired. By substituting an induction motor for the engine, this rig may be used for operation from a-c power lines.



Left: Hoist and Drill Motor with Texrope Drive to Drawworks.

Below: Generator Driven by Engine through Texrope Drives.





Allis-Chalmers "Shale Shaker" Mud Screen.

ALLIS·CHALMERS

MILWAUKEE WISCONSIN

1
2
3
4
5
6
7
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CLARK BROS
CO.
NO. 3
OKLAHOMA
DRIVE
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TULSA BOILER
MACHINERY
CO.
NO. 5
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21
GATES HARDWARE
CO.
NO. 11 SKELLY DRIVE
MEMORY OF
HERTZBERGER

A GOOD WORKER! ★ ★ ★ ★

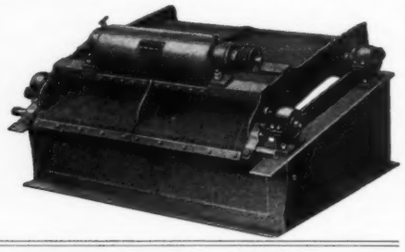
EFFICIENT service for a long period of time at lowest operating and maintenance costs is one of the many outstanding advantages of the McNEELY Vibrating Mud Screen. A curved screen surface (exclusive) provides for rapid removal of waste cuttings; a vibrating force, transmitted *equally* to *all* parts of the screen, eliminates dead spots, and compact, sturdy, all-steel construction saves ground space and head room.

Ask your Supply House or write for illustrated Catalog.

FOR COMPLETE DETAILS SEE PAGE 1279 COMPOSITE CATALOG

VERNON TOOL CO., LTD.
2740 East 37th St., Los Angeles, Calif., U.S.A.
Gulf Coast and Mid-Continent Representative
BAROID SALES CO., HOUSTON
EXPORT
The National Supply Corp. · Oil Well Supply Co.

McNEELY Vibrating Mud Screen providing clean drilling mud at Hobbs, New Mexico



The McNEELY *Vibrating* MUD SCREEN

See Our Display, Featuring

OTIS SQUARE KELLY DRILLING HEAD

for Use in

Drilling Under Pressure

with

Square Kelly

and

ORDINARY OUTSIDE COUPLED DRILL STEM

BOOTH 35 — OKLAHOMA BUILDING
NINTH INTERNATIONAL PETROLEUM EXPOSITION
Tulsa, Oklahoma, May 16 to 23, 1936

OTIS PRESSURE CONTROL, INC.

Tower Petroleum Building . . . Dallas, Texas

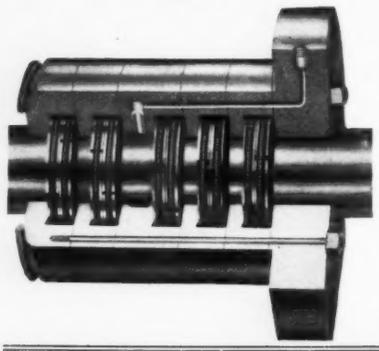
Houston, Texas
Hobbs, New Mexico
Wellsville, N. Y.
Oklahoma City, Oklahoma
Midland, Texas
Ada, Oklahoma

ALLIS CHALMERS
No. 2
OIL CITY
WAY
JENSEN BROS.
MFG. COMPANY
No. 5
PENNSYLVANIA AVE.
YOUNG ENGINE Corp
TERRY STEAM TURBINE Co
SLUDGE PUMPING INC.
No. 4 SKELLY DRIVE

A.O. Smith CORPORATION
Booth 87-88
OKLAHOMA BLDG.
The CHARLES N. HOUGH MANUFACTURING CO.
Booth 123-124-TEXAS BLDG.
OIL COUNTRY SPECIALTIES MFG. COMPANY
Booth 10-11
OKLAHOMA BLDG.
SEE ALSO OUTSIDE SPACE ALSO
ELLIOTT COMPANY
MERCO NORDSTROM VALVE CO.
&
PITTSBURGH EQUITABLE METER CO.
Booth 37-38
SCIENTIFIC & TECHNICAL
Wagner ELECTRIC CORP.
Booth 55
OKLAHOMA BLDG.

NATIONAL RADIATOR CORPORATION
Booth 12-13
CALIFORNIA BLDG
THE OSBORN MFG. COMPANY
Booth 5
ARCADE
A.P. GREEN FIRE BRICK COMPANY
Booth 76
SCIENTIFIC & TECHNICAL
SAIRSET
DIAMOND CHAIN & MFG. CO.
Booth 31
SCIENTIFIC AND TECHNICAL BLDG.
New! TRIMO ALLOY
TRIMONT MFG. CO Inc
BOOTH 100
OKLAHOMA BLDG.

COOK'S METALLIC PACKINGS FOR RECIPROCATING RODS



SEE YOU AT THE INTERNATIONAL PETROLEUM EXPOSITION 1936

WORLD'S FAIR OF THE OIL INDUSTRY TULSA, U.S.A. 1936

BOOTH 51 **TEXAS BUILDING**

- **SEE the ALL-METAL PACKING that has become the accepted standard in the Oil and Gas Industry because it eliminates rod scoring, reduces packing friction and wear, and cuts power, operating and maintenance costs. Furnished as original equipment by leading gas engine and compressor manufacturers and used by leading operators everywhere.**
- **SEE the PISTON RINGS which predominate in the Natural Gas and Natural Gasoline Industries — the choice of leading operators everywhere and of many engine and compressor manufacturers because: COOK'S Rings have longer life . . . substantially reduce cylinder wear . . . cut maintenance and operating costs way down.**
- **If you are not going to the Show, write for descriptive bulletins.**

"Sealing Pressures" Since 1888"

C. LEE COOK MANUFACTURING CO.
INCORPORATED
LOUISVILLE, KY. U.S.A.
NEW YORK-CHICAGO-TULSA-LOS ANGELES-SAN FRANCISCO

COOK'S GRAPHITIC IRON PISTON RINGS

The Bank Where Oil Men Feel at Home

Looking for the men you want to see in Tulsa at the I. P. E.? You'll find many of them in the First National Bank lobby during the Show. For though they may not all be Tulsans, many of them bank at the Tulsa First National — which oil men have found a good place to bank since oil was first discovered in Oklahoma.

WE BANK ON OIL

FIRST NATIONAL BANK
AND TRUST COMPANY
OF TULSA

FORTY-ONE YEARS OF CONSTRUCTIVE BANKING

Member Federal Deposit Insurance Corporation

Landis
MACHINE CO.
NO 5-7
OKLAHOMA - BLDG
Hills McCanna
Company
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TIMKEN ROLLER
BEARING CO
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CARSON MACHINE
& SUPPLY CO.
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CABLE CO.
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TAG
C.J. TAGLIABUE MFG
CO.
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SCIENTIFIC & TECHNICAL
BLDG
DEARBORN
CHEMICAL CO
NO. 105.
TEXAS BLDG
CARSON
NO-OX-ID
NO-OX-ID
NO-OX-ID
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KEROTEST MFG CO.
★ BOOTH 89-122A
OKLAHOMA BLDG.
JOYCE CRIDLAND COMPANY
BOOTH 49-50
TEXAS BUILDING
CHINSAN OIL TOOL COMPANY
BOOTH 25, 26
REFINERS & MARKETERS
OKLAHOMA STEEL CASTINGS CO
BOOTH 47-48
TEXAS BUILDING

A 7 STAR FEATURE

at the Oil Exposition

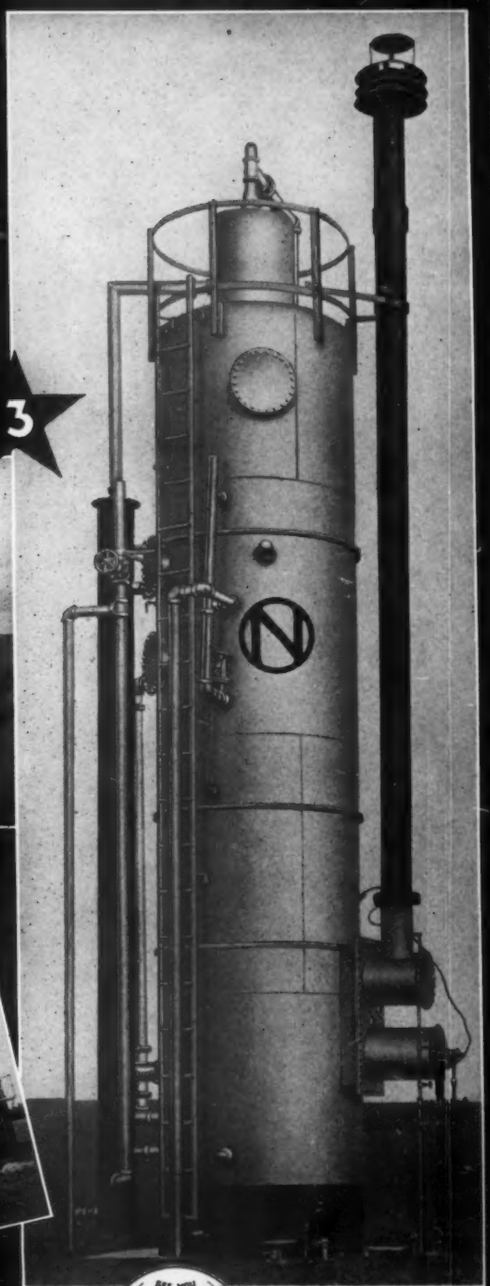
4

National Bolted Metal Tanks. Sizes 65 to 10,000 barrels capacity.

7

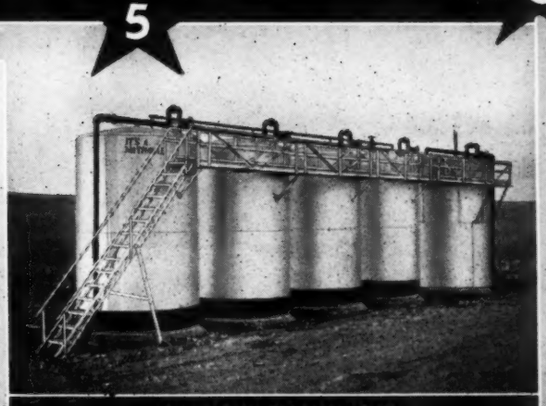
National Titeline Couplings, For Pressure or Vacuum Service.

3



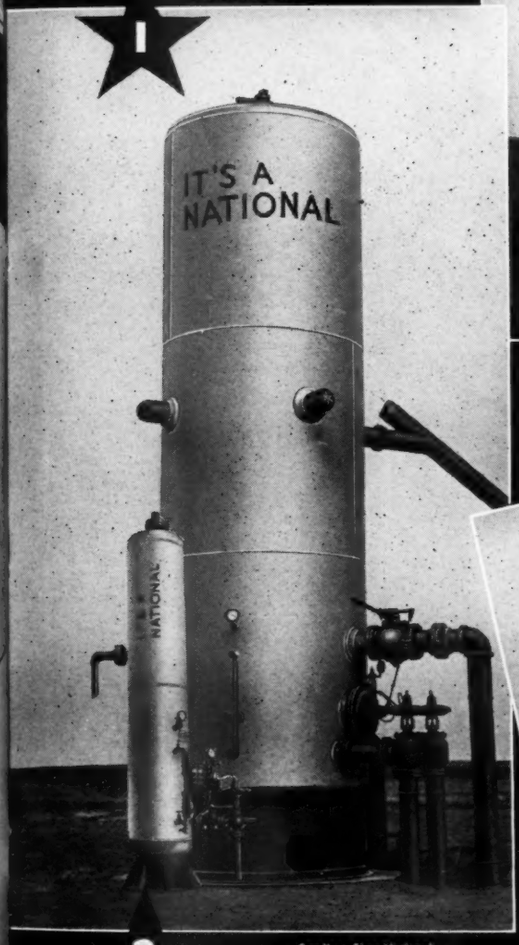
National Emulsion Treater. Made for Capacities of 25 to 2500 barrels per day.

5



National Welded Oil Field Stock Tanks. Sizes 10 to 340 barrels capacity.

1



Largest Size National Separator, 7'x24'.

6

National Wooden Oil Field Stock Tanks. For Water or Oil Storage.

2

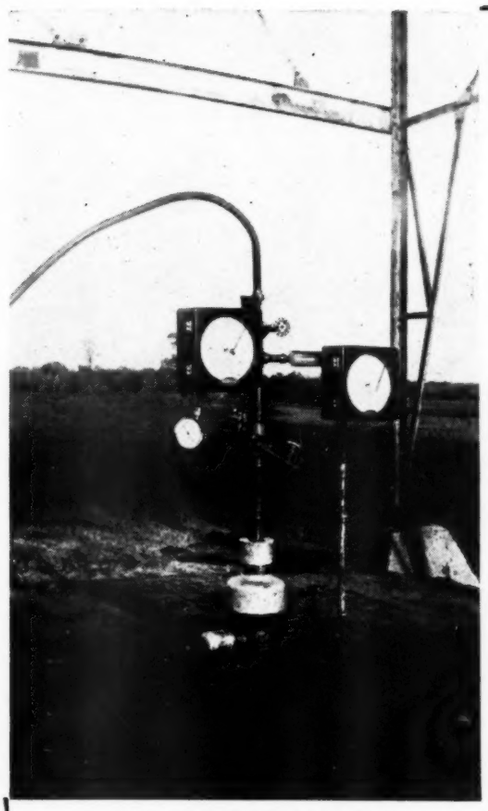
Smallest Size National Separator, 2'x9'.

SEE YOU AT THE INTERNATIONAL PETROLEUM EXPOSITION 1936 9TH WORLDS FAIR OF THE OIL INDUSTRY TULSA, U.S.A. MAY 16 TO 25

NATIONAL TANK COMPANY

TULSA. OKLAHOMA.– U.S.A.

REPUBLIC
ELECTRIC WELD
NO 16-21 ★ TEXAS BLDG
JOHNS MANVILLE SALES CORP ★★ NO. 87. TEXAS BLDG
READING-PRATT & CADY CO., INC. ★ NO. 85. OKLAHOMA BLDG
GATKE CORP. NO. 23 24 ★ CALIFORNIA BLDG
NO-FADE BRAKE BLOCK



View of G-P-I Field Hook-Up

The Working Model *of the* G-P-I SYSTEM

Of Flowing Oil Wells

which amazed Engineers at the Houston Show,

IS ON DISPLAY

at the Tulsa Exposition . . . . May 16-23

Booth 27, California Building

Production Engineers and Superintendents will see at the Tulsa Show the actual performance of this revolutionary gas lift method that has the field talking. They'll readily understand the numerous advantages it has over conventional methods of flowing oil by artificial aid. The model on exhibit is equipped with glass casing and transparent tubing and valves so that the working principle of the G-P-I System is plainly unfolded to visitors.

G-P-I Engineers welcome you to this display. For an uninterrupted study of the Patented G-P-I Working Model special appointments are invited.

SOUNDNESS OF DESIGN

Gas Power-Incorporated

Houston GPI SYSTEM Texas

EXPERIENCE IN HANDLING

Patented and Patents Pending

A SWAB THAT GOES DOWN EASILY

- Largest possible by-pass area permits free falling.
- Minimum of friction going into the hole.
- Freely pulls an efficient load each run.
- Rubbers automatically expand by hydraulic action.
- Simplicity of design insures proper rubber adjustment, compensating for wear.
- Reversible rubbers give longer life.
- Ease of part replacement means lower upkeep.
- Reversible valve permits down swabbing.
- Rubbers of different hardness and elasticity supplied to fit different well conditions.

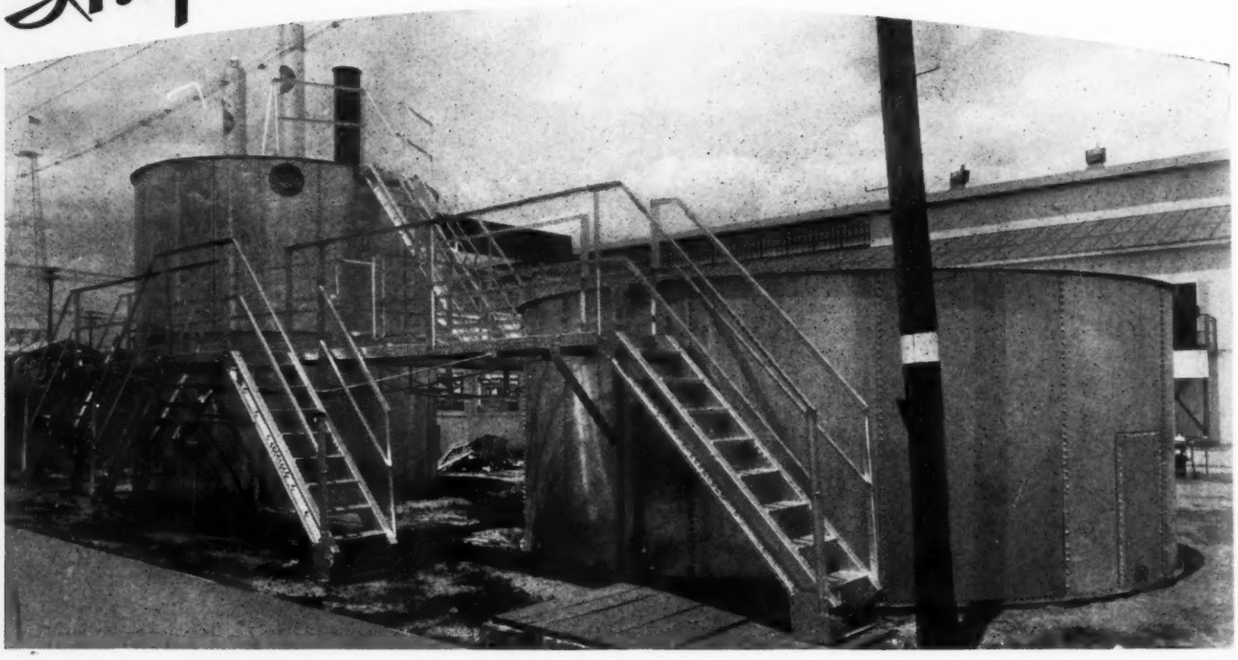
Let us tell you how this rubber stays young.
Engineering data and prices on request.

M·O·JOHNSTON OIL TOOLS INC·

3117 San Fernando Road » Los Angeles, Calif.
Phone Albany 0186
Mid-Continent Distributor: J. L. JOHNSTON
1530 Bonnie Brae » » Houston, Texas

MINE SAFETY APPLIANCES CO.
BOOTH 48-49
OKLAHOMA BLDG.
RIDGE TOOL CO.
BOOTH 30-31
TEXAS BLDG.
THE BRISTOL COMPANY
BOOTH 1-2
SCI. & TECH. BLDG.
DOWELL INC.
BOOTH 46-59
CALIFORNIA BLDG.
WICKWIRE SPENCER STEEL CO.
BOOTH 109-110
OKLAHOMA BLDG.
WICKWIRE SPENCE

Inspect AT THE EXPOSITION



PRE-FABRICATED "DOUBLE HOT-DIP" GALVANIZED TANKS

7 lbs. of zinc per 100 lbs. of steel

MALONEY has the reputation for doing things **thoroughly** and **well**—and we are living up to our reputation in the galvanizing job we are doing on MALONEY Galvanized Tanks for "sour crude" storage.

The heavy galvanized coating is the solution. We apply to our standard bolted steel tanks by the superior double hot-dip process a tenacious galvanized coating weighing seven pounds of galvanizing spelter to the one-hundred pounds of steel.

The galvanizing company doing our galvanizing work have a background of forty-five years' experience, and they inform us that a single hot dipped coat will increase the weight of the steel five pounds per one-hundred pounds of steel and that the inspection of the single coat will stand six one-minute dips in a copper sulphate solution commonly known as the **Preece test. A complete description of this test is found in the A.S.T.M. Standards, 1927 Edition, Serial designations A-90-24, Appendix pp. 347-348.**

By actual scale weight before galvanizing and after our double hot-dip process, the weight of the original steel is increased by seven and one-half pounds of galvanizing spelter to the 100 lbs. of steel. Our special bolts of 90,000 lbs. tensile strength are also hot-dip galvanized and have nuts with re-tapped threads.

Our display at the Exposition consists of a high-type and a low-type 500 barrel double hot-dip galvanized tank with an assembly of our sectional steel stairway and walkway with cantilever type and self supporting construction. The walkways have welded corners and underneath welded supports every two feet. Both stairway and walkway are non-skid. The height of the railing is 42" from the top of walkway.

MALONEY TANK MFG. CO., 38 N. Peoria, Tulsa, Oklahoma

AT THE SHOW

Be sure to visit our exhibit,

BOOTH 14
Refiners and Marketers Bldg.

and our installation (shown above), adjoining the building on

OKLAHOMA DRIVE

AD

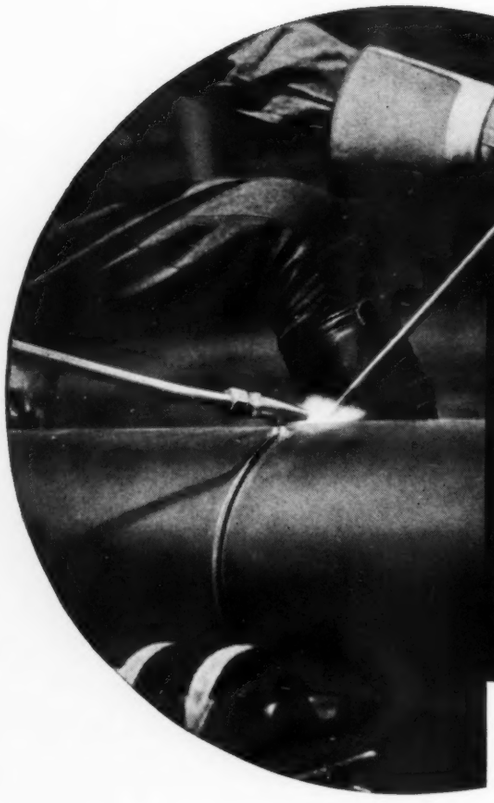
KEYSTONE AMERICAN

MALONEY PATENTED BOLTED COPPER-STEEL TANKS MALONEY

PITTSBURGH STEEL CO.
BOOTH 4-6
TEXAS BLDG.
GREENHEAD BIT AND SUPPLY COMPANY
BOOTH 25
CALIFORNIA BLDG.
EDWARDS WIRE ROPE
STERLING
VORTOX MFG. CO.
BOOTH 75
OKLAHOMA BLDG.
SHERWIN-WILLIAMS CO.
BOOTH 53-54
OKLAHOMA BLDG.
FIRE APPARATUS CO.
BOOTH 2
CALIFORNIA BLDG.
DARLING VALVE & MFG. CO.
BOOTH 101-102
OKLAHOMA BUILDING

NATIONAL TANK CO.
N
BOOTH 96-115 TEXAS BLDG.
TOLEDO PIPE THREADING MACHINE CO.
BOOTH 30-31
CALIFORNIA BLDG.
AMERICAN LA FRANCE and FOAMITE IND. INC.
BOOTH 102-103
TEXAS BLDG.

THE WEBSTER ENGINEERING CO.
BOOTH 22-23
OKLAHOMA
Coffing HOIST CO.
BOOTH 50
CALIFORNIA BLDG.
LINK-BELT COMPANY
BOOTH 60-61
TEXAS BLDG.



MULTI-FLAME *the Standard Method*

• Metallurgically sound welds are assured by Multi-Flame Lindewelding. Each Lindeweld is strong, ductile, corrosion-resistant and free from defect.

THE Lindewelding process was introduced a little over five years ago. During this time, it has won the acceptance of leading pipe line companies and contractors as the standard method of joining pipe.

More than 5,000 miles of pipe lines have been Lindewelded. On each line Lindewelding has contributed dependability, speed, and low construction cost.

Lindewelding is Dependable

This is reflected in the records of many projects of which the following are typical:

On one important project many miles of lines—6-in. to 14-in. in diameter—for gas, oil and water were Lindewelded. Upon completion the lines were tested under 200-lb. water pressure. Every Lindeweld was leakproof and has remained so.

On an 80-mile piping system for a gasoline plant, Lindewelding was used after careful tests had proved that this method produces dependably uniform results. costs less, and could be done in less time. The completed system was tested under pressure and the company's engineers reported "Not a single defective weld."

Lindewelding Saves Time

On a 42-mile line of 10-in. diameter pipe, Lindewelding effected a 25 per cent saving in welding time over older methods.

On a line of 6-in. pipe, a record of 89 welds per man-day was achieved by men with little previous experience with Lindewelding. Formerly 60 welds a day had been a good average.

On another line, ten miles of 8-in. pipe were Lindewelded in three days. A six-man crew averaged 304.6 welds a day—a 50 per cent increase over the average previously established on 14 miles of the same line.

The Lindeweld is Tough

Recently a bend test was made on a 60-ft. section of Lindewelded 6-in. pipe. With the section securely blocked so the two Lindewelds would get the greatest stress, a tractor bent the cold pipe through a half circle. Neither of the Lindewelds cracked, collapsed or buckled.

Uniform Results

Lindewelding has, as its first requirement, the uniform production of welds fully as strong and as ductile as the pipe itself. This new technique at the same time doubles or triples the daily production of sound welded joints. It saves 15 to 40 per cent in oxygen, acetylene and welding rod and often as much as 50 per cent in time.

The multi-flame head for Lindewelding further improves these results. Multi-Flame Lindewelding will produce consistently full-strength welds in pipe base-material even where extra high-strength pipe up to 110,000 lb. per sq. in. in tensile strength is used.

20,000 Miles of Pipe Line Welding Experience

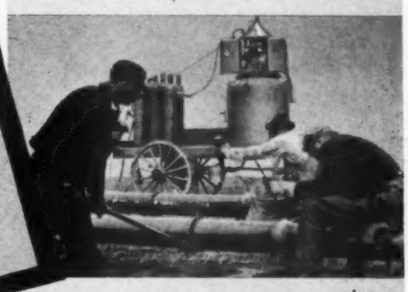
Multi-Flame Lindewelding is a result of the closely coordinated laboratory development, and field engineering facilities of the Linde organization, which has fostered the progress of oxy-acetylene welding and cutting in pipe line construction since its first use on an overland pipe line in 1911. This organization, because of long experi-

LINDEWELDING
for Pipe Line Construction

• Pipe line of 20-in. diameter for public gas service being Multi-Flame Lindewelded.

• Not a leak developed in any Lindeweld in this gasoline line when a flood washed it fifteen feet down stream.

• Multi-Flame Lindewelding a pipe line 8-in. in diameter to carry gas.



• Oxweld Type MP-4 Acetylene Generator supplies acetylene for Multi-Flame Lindewelding on 143-mile 8-in. oil pipe line.

ence in the pipe line field, is well qualified to assist you in organizing welding operations to secure the greater strength, ductility and economy now obtainable with this new process. Linde Process Service has been identified with the welding of more than 20,000 miles of pipe in the oil fields alone. Why not have Linde work with you on your next pipe line project?

Multi-Flame Lindewelding Movie

A motion picture, "Multi-Flame Lindewelding," has been produced to show the multi-flame blowpipe head in operation, and to demonstrate the correct technique for its use. Ask the Linde Office nearest you to arrange a showing of this motion picture before members of your organization. This will not obligate you.

Left: Section from motion picture film showing the three flames from the blowpipe over the area of molten metal in the weld.

UCC
UNION CARBIDE AND CARBON CORPORATION

Everything for Oxy-Acetylene Welding and Cutting

LINDE OXYGEN · OXWELD APPARATUS AND SUPPLIES
PREST-O-LITE ACETYLENE · UNION CARBIDE

THE LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
UCC
Sales Offices in 30 Principal Cities and
30 East 42nd Street, New York, N. Y.
In Canada: Dominion Oxygen Company, Limited, Toronto

No. 50

No. 7

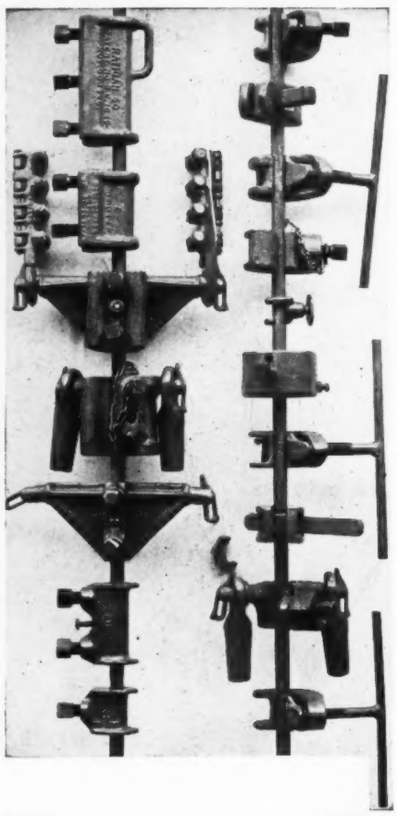
No. 8
With (2)
No. 6-5 Wire
Line Clamps

No. 6
With (2)
No. 6-4
Babbitt
Sockets

No. 74

No. 44

No. 49



No. 2
Heavy with
Screw

No. 47

No. 2
Heavy with
Tee Handle

No. 3
Old Style

No. 76

No. 80

No. 2
Medium

No. 83

No. 3
New Style
with (2)
No. 6-4
Babbitt
Sockets

No. 2
Light

GRIPS CLAMPS

RATIGAN

SURE-GRIP DEVICES

are the result of long experience and complete knowledge of oil field conditions and requirements and assure operators of the maximum efficiency, economy and safety in producing wells of all depths.

Ratigan No. 12 Walking Beam Rocker

Many major oil companies are using these Rockers as standard equipment on wells pumping up to 8,210 feet in depth. Fits any make of round or square, wood or steel post; or any wood or steel beam.

For detailed information on Ratigan products write for latest catalog and literature.

J. P. RATIGAN

1213 Santa Fe Avenue Los Angeles, California

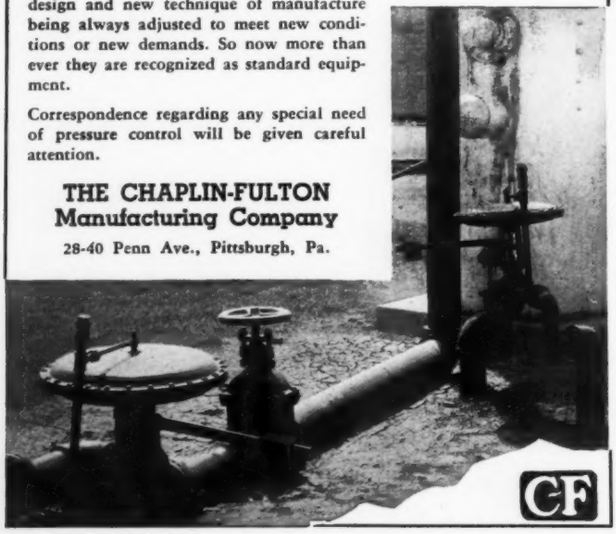
A FULTON *is at Home*

in the most modern service

WHERE the most advanced methods and the most highly specialized equipment are used, and where the most precise and unfailing control of presures is required, in any department of industry, Chaplin-Fulton Regulators will be found at work. For more than fifty years, they have been used with success and satisfaction, new design and new technique of manufacture being always adjusted to meet new conditions or new demands. So now more than ever they are recognized as standard equipment.

Correspondence regarding any special need of pressure control will be given careful attention.

The Regulators here seen are in operation in a flowing plant of an active Oklahoma oil field

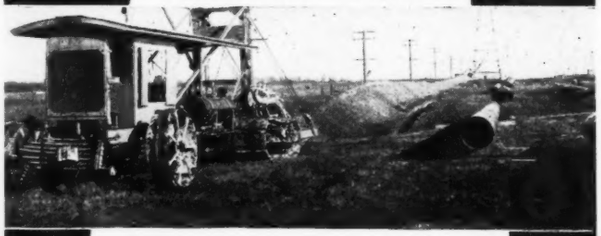


THE CHAPLIN-FULTON Manufacturing Company

28-40 Penn Ave., Pittsburgh, Pa.

CF

Simplifies THE BIG JOBS



Put a Buckeye Ditcher on any job, and you can be sure that the ditch will be completed at lowest cost and right on schedule.

For the BIG jobs, you will need the Buckeye Model 48 that digs trench from 22 inches to 40 inches in width and up to 8½ feet deep. May we send you complete operating data?

Use Model 48 *by* **Buckeye**

BID THE Buckeye WAY ask for our operation data before you bid

FOR THE BIG JOBS—

THE BUCKEYE TRACTION DITCHER CO., FINDLAY, O.

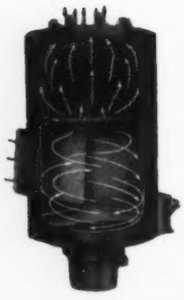
We invite you to our Booth No. 3, Pennsylvania Avenue, during the Tulsa Petroleum Exposition

OTIS PRESSURE CONTROL INC.
No. 35
OKLAHOMA BLDG
C.A. MATHEY MACHINE WORKS
No. 16.
ARCADE BLDG
DURAMETALLIC CORP.
No 7
TEXAS BLDG
WICO ELECTRIC CO.
No. 110
TEXAS BUILDING
TWIN DISC CLUTCH COMPANY
No. 79-80
OKLAHOMA BUILDING
BLACK SIVALLS & BRYSON INC.
No. 39-66
CALIFORNIA BLDG

A PUBLIC ENEMY EVEN "G" MEN CAN'T *Conquer!*

DUST—one of the most formidable disasters yet experienced by the Midwest. Millions of dollars damage has resulted from it. Yet Vortox Air Cleaners are operating through the most severe dust storms without shut-downs of plants or engines.

Vortox Air Cleaners are being demanded by most users. Proof of the popularity of VORTOX is easily obtained by inspecting the 15 or 20 exhibits of engine manufacturers at the Tulsa Oil Show. Just count the number of Vortox installations!



VORTOX MANUFACTURING CO.
CLAREMONT, CALIFORNIA

Look for the VORTOX WORKING DEMONSTRATION *at Booth No. 75, Oklahoma Building, Tulsa Oil Show.*

VORTOX OIL TYPE SELF-WASHING AIR CLEANER

See the
New and Improved

JENSEN
PUMPING UNITS
and
ROD LINE JACKS

●

9th INTERNATIONAL PETROLEUM EXPOSITION

●

Any producer who will take a little time to study the JENSEN exhibit at the Tulsa Show can make his trip pay rich dividends for the rest of his business days!

If you aren't coming to the Exposition —write or wire us before you equip that next pumper.

JENSEN BROTHERS MANUFACTURING COMPANY

Coffeyville, Kansas, U.S.A.

JENSEN JACKS

Miller Sand Pump Company
No. 10.
Oil City Way
International Harvester Co of America
No 3.
Arcade Way
All Steel Products Manufacturing Co
No. 9. Arcade Way
Sullivan Machinery Company
No. 3.
Beeville Lane

BRADFORD MOTOR WORKS
No.6. DRAKE DRIVE
TULSA
RIG REEL & MFG
COMPANY
No.8.
DRAKE-DRIVE
CATERPILLAR
TRACTOR COMPANY
No.10.
SKELLY DRIVE

is the Right Move for 1936

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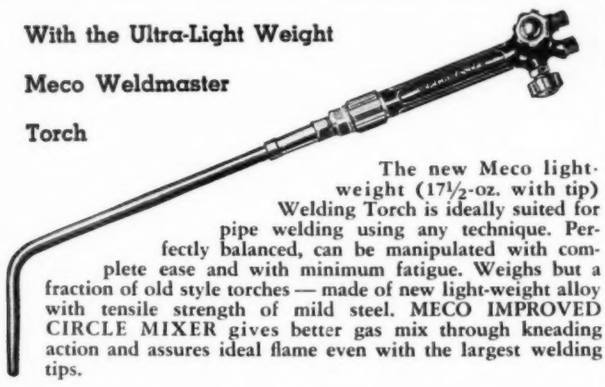

The new Meco light-weight (17½-oz. with tip) Welding Torch is ideally suited for pipe welding using any technique. Perfectly balanced, can be manipulated with complete ease and with minimum fatigue. Weighs but a fraction of old style torches — made of new light-weight alloy with tensile strength of mild steel. MECO IMPROVED CIRCLE MIXER gives better gas mix through kneading action and assures ideal flame even with the largest welding tips.

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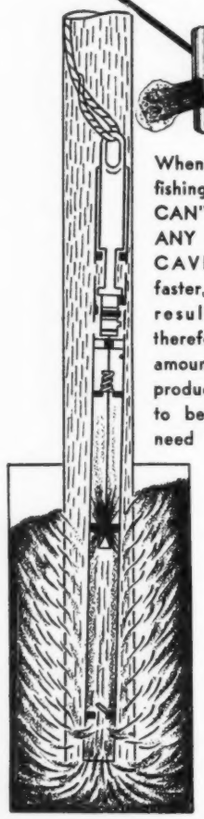

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PROGRAM

International Petroleum Exposition

TULSA, OKLAHOMA — May 16 to 23, 1936

Saturday, May 16

Refiners Day: W. G. Skelly, President Skelly Oil Co., host.

Directors of the Day: Clyde Alexander, R. H. Bartlett, Frank R. Billingslea, Allmand M. Blow, A. F. Bourne, W. M. Bovaird, A. E. Bradshaw, J. H. Brooks, E. J. Bullock, and W. L. Connelly.

In Honor of: West Virginia, Pennsylvania; Sistersville, Clarkesburg, Oil City, Bradford, Titusville, Franklin.

9:30 a. m. Exposition gates open.
2:00 p. m. Opening ceremony in charge of the American Legion. W. A. Irvin, President of United States Steel Corp., will give the opening address.
3:00 p. m. Registration of delegates from foreign countries, Exposition office at grounds.
4:00 p. m. Registration of "Old Timers" of the petroleum industry in replica of old Drake well, Exposition grounds.
6:30 p. m. Band Concert, Exposition grounds.
8:30 p. m. Pawnee Bill's Rodeo, Tulsa State Fair Pavilion.

Sunday, May 17

Natural Gasoline Day: W. K. Warren, President Warren Petroleum Co., Host.

Directors for the Day: O. T. Dawson, R. E. Day, C. P. Dimit, Ray L. Dudley, George A. Dye, R. S. Ellison, W. S. Farish, Harold B. Fell, E. R. Filley, and W. S. Fitzpatrick.

In Honor of: California, Oklahoma; Los Angeles; Seminole, Drumright, Ada, Glenpool, Cushing, Fairfax.

9:30 a. m. Exposition gates open.
3:00 p. m. Ceremony dedicated to "Old Timers," Exposition grounds. Rev. Guy Tetrick, chairman.
6:30 p. m. Band Concert, Exposition grounds.
8:45 p. m. Oil Fire Demonstration. Tulsa State Fair Grandstand.

Monday, May 18

Production and Purchasing Agents Day: R. B. Pringle, vice-president Tidewater Oil Co., host.

Directors for the Day: J. P. Flanagan, Walter Fleming, C. W. Flint, H. V. Foster, Jacob France, Wirt Franklin, J. H. Gardner, Robert F. Garland, J. Burr Gibbons, and Walter Gray.

In Honor of: Michigan, Ohio; Findlay, Muskegon.

9:30 a. m. Exposition gates open.
10:00 a. m. Junior Chamber of Commerce Young Oil Men's Day, registration, Lobby Third Floor, Tulsa Building. Student engineers day, sponsored by University of Tulsa.
12:00 noon Luncheons: Civitan Club, Alvin Hotel; Kiwanis Club, Mayo Hotel.
2:00 p. m. to 4:00 p. m. Junior Chamber of Commerce Young Oil Men's Trip through the Diamond D-X Refinery.
6:30 p. m. Band Concert, Exposition grounds.
8:30 p. m. Junior Chamber of Commerce, Young Oil Men's Stag Party, University Club, Tap room.
8:30 p. m. Pawnee Bill's Rodeo, Tulsa State Fair Pavilion.

Tuesday, May 19

Pipeline Day: R. O. Dietler, vice-president Stanolind Crude Oil Purchasing Co., host.

Directors for the Day: Rush Greenslade, Henry Greis, L. S. Gregory, S. A. Guiberson, Jr., P. D. Hayes, J. M. Hayner, Alf G. Heggem, J. H. Hill, Frank J. Hinderliter, and B. E. Horrigan.

In Honor of: Kentucky, Kansas; Bowling Green, Owensboro; Wichita, Eldorado, McPherson, Ashland, Hays, Hutchinson.

12:00 noon Luncheons: Junior Chamber of Commerce, Chamber of Commerce dining room; Traffic Club, Mayo Hotel.
12:00 p. m. Junior Chamber of Commerce, Young Oil Men's luncheon, Chamber of Commerce dining room, 4th floor Tulsa Building.
1:30 p. m. Junior Chamber of Commerce, Young Oil Men's Trip to Beggs, Oklahoma, for Seismograph demonstration through courtesy of Seismograph Corporation.
6:00 p. m. Dinner for foreign delegates.
6:00 p. m. Purchasing Agents Association of Tulsa and Oil Company Buyers Group of the National Association of Purchasing Agents, Tulsa Club.
6:30 p. m. Band Concert, Exposition grounds.
8:30 p. m. Junior Chamber of Commerce Young Oil Men's Dance, Crystal Ballroom, Mayo Hotel, 16th floor.
8:30 p. m. Pawnee Bill's Rodeo, Tulsa State Fair Pavilion.

Wednesday, May 20

Marketers Day: R. W. McDowell, vice-president Mid-Continent Petroleum Corporation, host.

Directors for the Day: Fred W. Insull, Roy B. Jones, P. C. Lauinger, Clarel B. Mapes, Joseph R. McGraw, D. F. McMahon, Walter Miller, E. H. Moore, and William D. Moorer.

In Honor of: Texas, Louisiana; Midland, Amarillo, Houston, Fort Worth, Dallas, San Antonio, Monroe, Longview, Tyler, Shreveport, Kilgore, Oklahoma City.

8:00 a. m. Golf Tournament opens, Tulsa Country Club, Frank Gray, chairman.
9:30 a. m. Exposition gates open.
12:00 noon. Luncheons: American Business Club, Alvin Hotel; Cooperative Club, Chamber of Commerce; Engineers Club of Tulsa, Brittlings; Lions Club, Mayo Hotel; Optimist Club, Hotel Tulsa; Rotary Luncheon for foreign delegates, Hotel Tulsa.
6:30 p. m. Band Concert, Exposition grounds.
8:45 p. m. Oil Fire Demonstration Tulsa State Fair Grounds.

Thursday, May 21

Drilling Contractors' Day: A. O. Olson, president Olson Drilling Co., host.

Directors for the Day: C. Morris, W. J. Morris, E. J. Nicklos, C. H. Pape, George Parker, E. B. Parriott, A. W. Peake, J. Edgar Pew, and Henry L. Phillips.

In Honor of: Colorado, Arkansas, Illinois; Denver, Eldorado, Casey, Robinson, and Holdenville, Oklahoma.

8:00 a. m. Golf Tournament, Tulsa Country Club.
9:00 a. m. Exposition gates open.
9:00 a. m. Independent Petroleum Association of America, Mayo Hotel.
10:00 a. m. Independent Petroleum Association of America, Mayo Hotel.
9:30 a. m. to 4:30 p. m. Safety Conference, Topaz Room, Hotel Tulsa.
12:00 noon Luncheons: Cosmopolitan Club, Hotel Tulsa; Hi-Twelve, Hotel Tulsa; Tulsa Geological Society, Chamber of Commerce.
12:30 p. m. Independent Petroleum Association of America, Directors luncheon and meeting, Mayo Hotel.
1:30 p. m. Awarding of medals to "Old Timers," Exposition grounds.
2:00 p. m. Independent Petroleum Association of America, meeting executive committee, Mayo Hotel.
6:00 p. m. Independent Petroleum Association of America, reception.
6:30 p. m. Band Concert, Exposition grounds.
7:00 p. m. Independent Petroleum Association of America, banquet, Mayo Hotel.
8:30 p. m. Pawnee Bill's Rodeo, Tulsa State Fair Pavilion.

Friday, May 22

Oil Scouts and Geologists Day: W. R. Francisco, secretary-treasurer Deep Rock Oil Co., host.

Directors for the Day: Waite Phillips, Warren C. Platt, F. O. Prior, Edward E. Robbins, Harry H. Rogers, E. J. Saltin, J. H. Satterwhite, W. A. Schlueter, and E. J. Sadler.

In Honor of: Wyoming, New Mexico; Casper, Gallup, Roswell, Carlsbad.

8:00 a. m. Golf finals, Tulsa Country Club.
9:30 a. m. Exposition gates open.
10:00 a. m. Tour of exhibits at Exposition grounds by safety group. National Stripper Well Association.
12:00 noon Luncheons: Chamber of Commerce, Tulsa Building; special exposition program.
2:00 p. m. First Aid Contest, demonstration, Exposition grounds.
6:30 p. m. Band Concert, Exposition grounds.
7:30 p.m. First Aid Meet Banquet and awarding of medals, Topaz room, Hotel Tulsa.
8:30 p. m. Pawnee Bill's Rodeo, Tulsa State Fair Pavilion.

Saturday, May 23

General Oil Industry Day: E. B. Reeser, president Barnsdall Oil Corporation, host.

Directors for the Day: R. C. Sharp, J. S. Sidwell, Earl Sneed, Hugh Stalcup, O. C. Staples, Jay P. Walker, M. F. Waters, T. R. Weymouth, and H. C. Weiss.

In Honor of: Montana, Mississippi, New York. Great Falls, Billings, Jackson, Olean, Corning.

9:30 a. m. Exposition gates open.
6:30 p. m. Band Concert, Exposition grounds.
6:30 p. m. Petroleum Group of Oklahoma Section, American Chemical Society, Alvin Hotel.
8:30 p. m. Pawnee Bill's Rodeo, Tulsa State Fair Pavilion.

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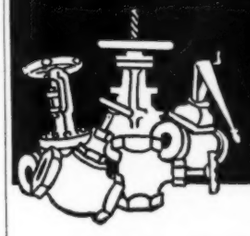

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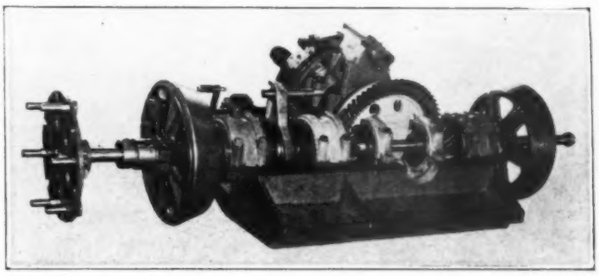

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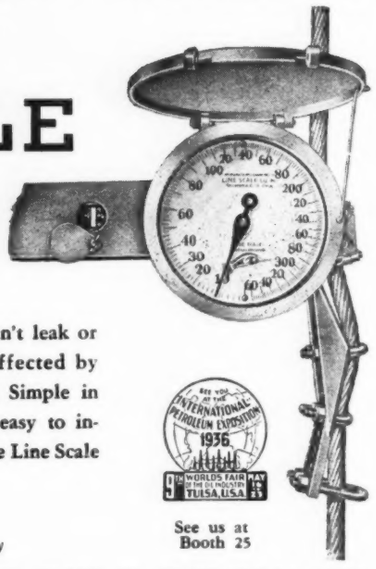

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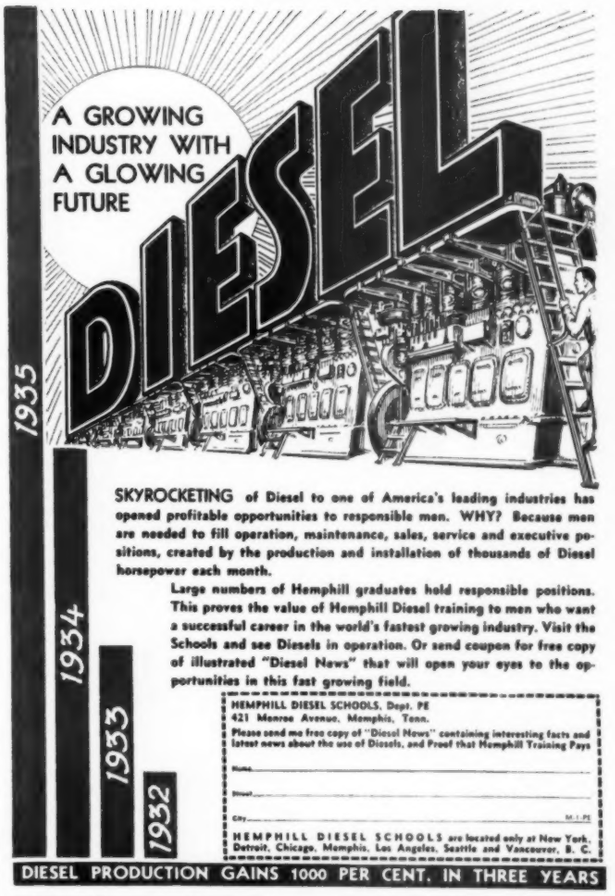
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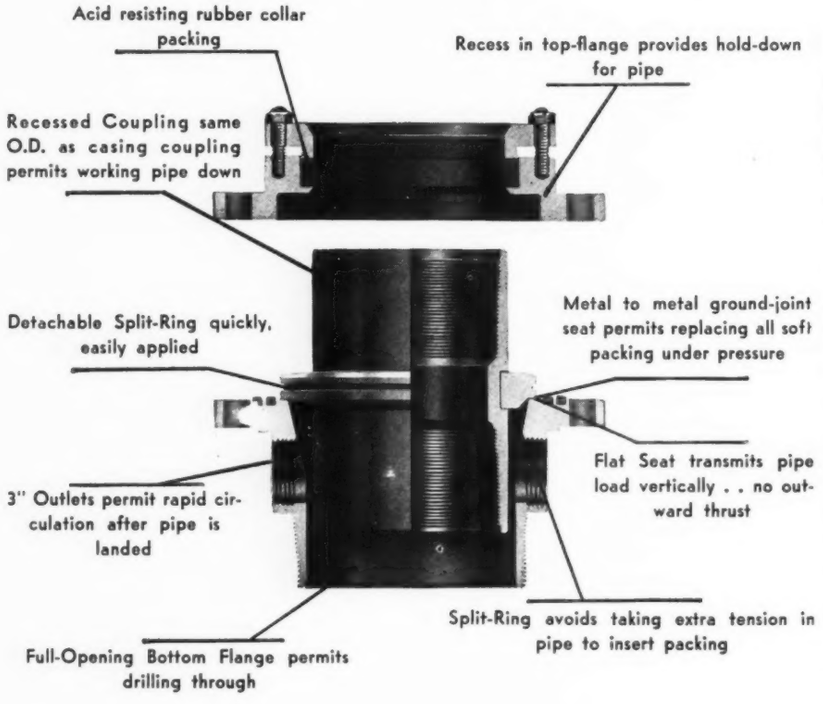
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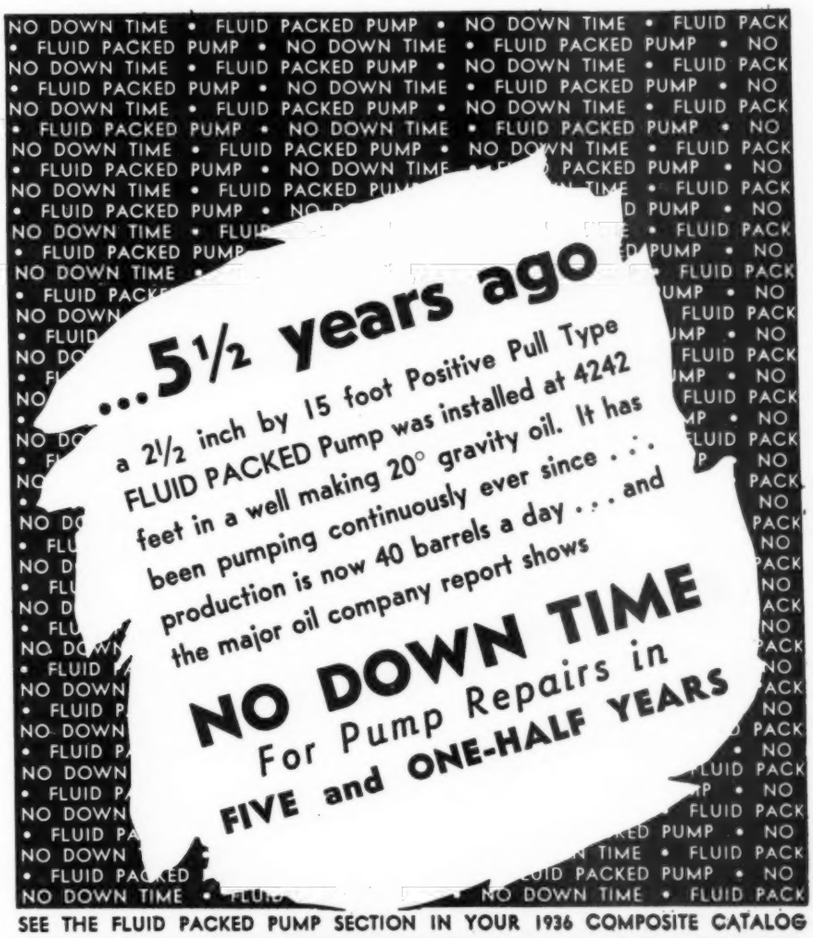
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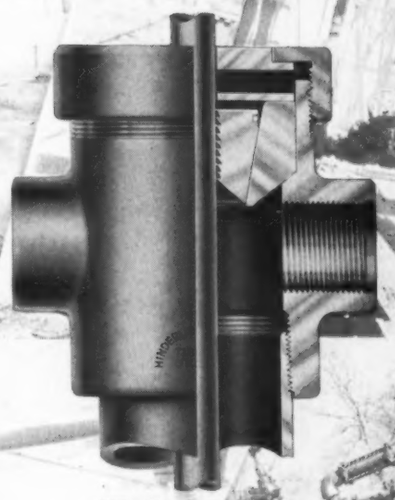

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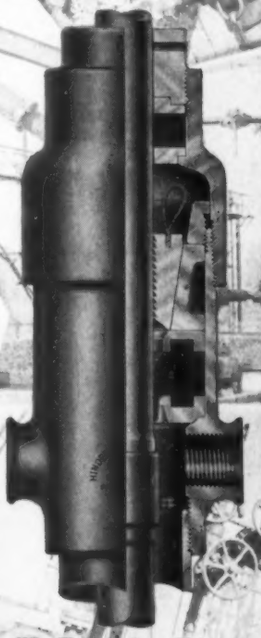

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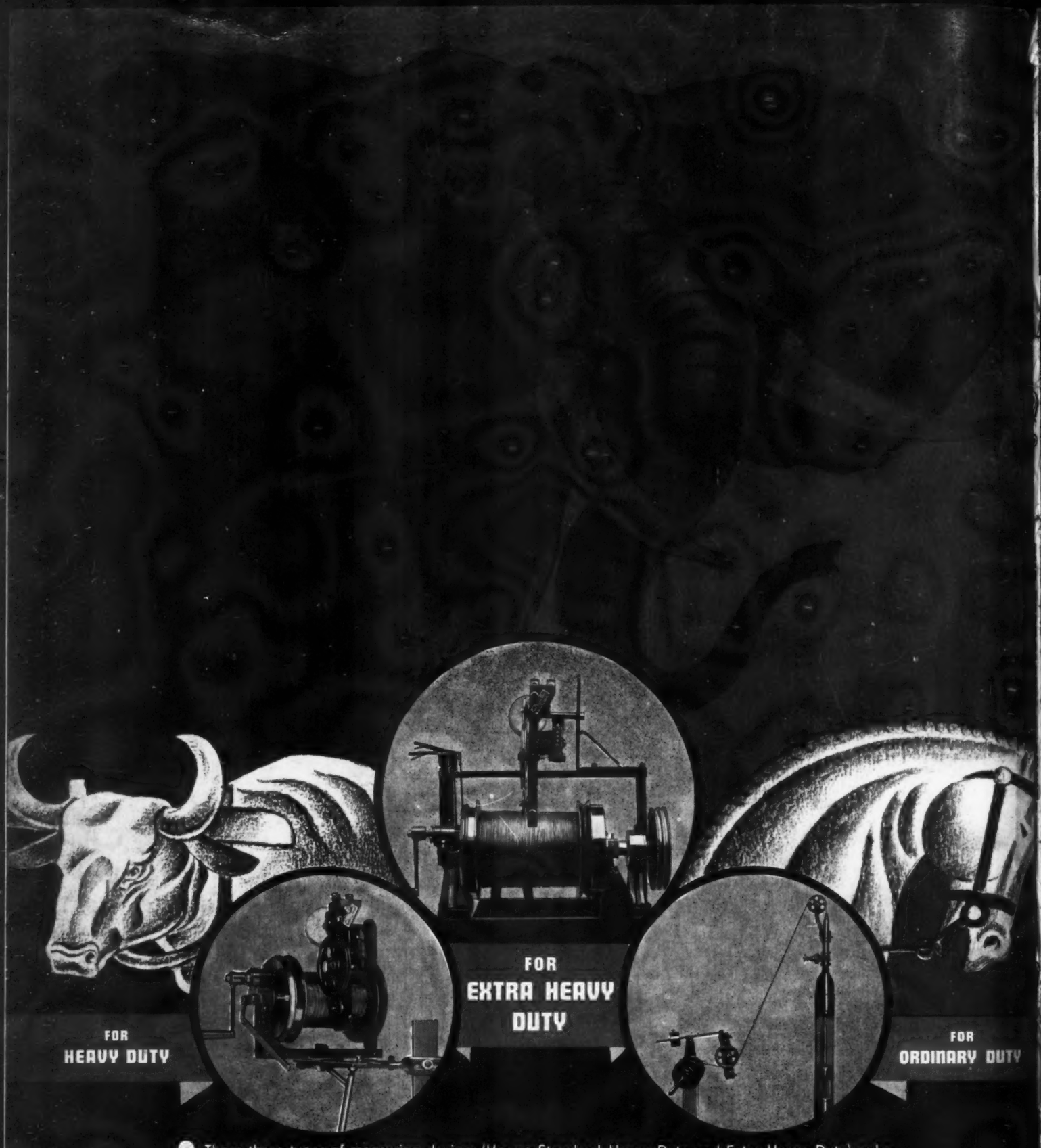

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